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THE
NATURAL HISTORY

OF

WATERS, || FOSSILS,
EARTHS, || AND
STONES, || MINERALS.

WITH THEIR
VIRTUES, PROPERTIES,
AND
MEDICINAL USES;

To which is added,

The Method in which LINNÆUS
has treated these Subjects.

BY

R. BROOKES, M. D.

Author of the GENERAL PRACTICE OF PHYSIC.

VOL. V.

LONDON:

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M DCC LXIII.

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The Method is...
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LONDON:
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in St. Paul's Church-yard.

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THE PREFATORY INTRODUCTION.

HE nature of Minerals, and the analysis of their various combinations, belong more properly to another branch of science. It would be unnecessary, therefore, to swell our work, with what will be found elsewhere with greater propriety. This subject, indeed, might give room for the display of much learning and more conjecture, but instead of gratifying a vain curiosity, it will be preferable to supply the reader with useful information. We shall therefore employ this Introduction in describing the various Mineral Waters to be found in *England*, which have contributed either to medicinal or commercial purposes, relate the chemical trials which have been made to find out their virtues, and the good effects which they have been experienced to produce in the constitution.

It is usual to give an account of their contents, after the evaporation of the water; but this is not sufficient in all cases, because there is often a volatility, when just taken from the spring, wherein the principal strength of the water resides, and which is lost if not immediately drank. Hence it follows, that the nature of the contents will not always ascertain the virtues of the waters. However, in recounting the effects and properties of these waters, all the circumstances will be taken notice of, that may tend to give an insight into their operations; and that each spring may be more readily found, I shall place the counties in which they rise in an alphabetical order.

B E R K-

BERKSHIRE.

IN this county we meet with but two Mineral waters, one at *Sunning-hill* in *Windsor-Forest*, which is of the same nature as the *Tunbridge* waters; and the other at *Comner*, or *Cumner*, three miles west of *Oxford*. This last water is always of a whitish colour, especially in the summer time when the well is low; the reason of which appearance is said to be owing to its proceeding from lime-stone. Oil of Tartar being dropt therein, causes it to let fall a white sediment; and Spirit of Hartshorn turns it to a pearl-colour; but with the Solution of Silver it turns to a purplish pearl-colour, and with Syrup of Violets, green. A gallon of this water will yield 296 grains of sediment, whereof 76 grains are lime-stone, and the remainder a calcarious nitre. The sediment is dark brown, with a saltish and very bitter taste; and will ferment with Vinegar as well as with Oil of Vitriol, and will also turn green immediately with Syrup of Violets. The salt itself is of a yellowish brown colour, and has a saltish, nauseous, bitter taste. It is a kind of calcarious nitre, but inclines more to an alcali than most others of this class. It is not much frequented; but it is known that a quart of it will purge a robust country fellow.

CORNWALL. The mineral springs in this county, have never been taken notice of 'till very lately, and that is by Mr. *Borlace* in his survey of *Cornwall*. *Madern Well* is only a spring of pure water, and it rises in the parish of *Madern*, four miles west of *Penzance*. However, it is resorted to by many people that are afflicted with pains, aches, and stiffness of the limbs; and it has done many cures, which may be only owing to the coldness and purity of the spring. *Euny Well* was so famous formerly, that there was a chapel erected
close

close by it, dedicated to St. *Eurnus*; and it still preserves its reputation for drying up humours and healing wounds and sores. However, as this has no evident mineral impregnation, these effects may be owing merely to the coldness of the water, which braces up the nerves and muscles, and strengthens the glands. Here is another well of this sort, called the *Holy Well*, which is about a mile and a half to the north-west of St. *Cuthbert's* church, in a cave that lies in a small sandy bay. In this cave, there are stones like icicles, that hang from the roof, and the floor of the rock is covered with the same substance. This water will not change the colour of green tea, nor curdle milk; from whence it is concluded, that it has neither alum nor steel in its composition. When this water is evaporated, it will deposit a small sediment, of the same colour and substance with the incrustations: it will neither melt nor flame, nor has it any particular taste or smell, and yet for all this, it is in great use for fluxes and disorders of the bowels.

The most remarkable Chalybeate Spring in *Cornwall*, rises in the tenement of *Colurian*, in the parish of *Ludgvan*. The bed through which this water runs is full of an ochreous, iron mineral, from which its taste and smell proceeds. It turns to a deep reddish purple with Galls, and with Oak-leaves it becomes of a bluish black, but has a purplish cast. When a thimbleful of Oil of Tartar was dropped into this water, it fell immediately to the bottom of the glass, which held about half a pint: but it precipitated no sediment, nor made any change in the water; only the colour was more inclinable to that of a bright oker, but was scarcely discernable. It will not turn silver black, and therefore it is concluded there is no sulphur in it; but in the morning be-

fore the water is stirred there is a film on the surface with all the colours of the rainbow, shooting too and fro, which occasions some to think, there is a naptha in the water. It will mix with milk, and lathers readily with soap; and after it has stood 24 hours in the open air, it undergoes no alteration from Galls, which is owing to the flying off of the volatile spirit. The virtues of this water are very great, for persons have been cured of the King's Evil, by drinking the water and washing the parts affected, whom Mr. *Borlace* knew; and he heard of many others that were cured in the same manner. It is very diuretick, promotes perspiration, opens obstructions of the bowels, and restores a lost appetite. It also cures sores of every kind, and is very good to wash the eyes with.

CUMBERLAND. At *Stanger* in this county, two miles south of *Cockermouth*, and three west of *Keswick*, there is a spring of clear saltish water, with the taste and smell of iron; it turns white with Spirit of Hartshorn; lets fall a great sediment with Oil of Tartar: a gallon of this water will yield 1170 grains of sediment; whereof 1080 are sea-salt, and the rest lime-stone. It is white, hot on the tongue, and grows very moist in a damp air. There is a little mixture of nitre with the sea-salt, but this last predominates, and is joined to a considerable quantity of iron. Four or five pints will purge upwards and downwards; but it is an excellent remedy in surfeits, pains in the stomach and breast, the green-sickness, scurvy, sores, and breaking out of the skin.

DERBYSHIRE. *Buxton Well*, lyes at the bottom of a dirty village of the same name, and there is a large commodious house, to which a great deal of good company resort in the summer-time. The water is neither so hot as that of
Bath,

Bath, nor so cold as that of *Bristol*. It has a sweet, pleasant taste, and a gallon will yield about 20 grains of a sediment, which consists chiefly of lime-stone, sea-salt, and a little calcareous nitre. It deposites a white sediment with Oil of Tartar; but it will not turn silver black, nor does it discover any signs of sulphur. It will not ferment with Spirit of Vitriol, nor turn green with Galls, 'till they have soaked four days therein. It is a temperate bath, and a very light water. It is of a relaxing, diluting, sweetening and attenuating nature; and will open obstructions of the smallest vessels. It is good in consumptions, for hot scorbutick humours, and all fluxions and bleedings, as well as in hypocondriacal and hysterical cases. It is of great use in the regular gout, in rheumatick and scorbutick pains; in vomiting of blood, and in fluxes of the piles, as well as all other hæmorrhages. It is good in internal inflammations, consumptions, the diabetes, and a bloody urine; as also in a bilious cholick, and want of appetite, and in cold stomachs from hard drinking. To these may be added contractions, cramps, convulsions, *St. Anthony's fire*, and all breakings out of the skin.

Matlock Bath is also in *Derbyshire*, near *Wirksworth*, and ten miles north by west of *Derby*. The village is seated on the very edge of the river *Derwent*, is a very beautiful place, and is frequented by very polite company. The water of the bath is not so hot as that of *Bristol*, and it curdles with soap. It deposites a white sediment with Oil of Tartar, and the same experiments give the same appearances as in *Buxton* water. A gallon of water yields 40 grains of sediment, whereof 13 are salt, consisting of nitre and sea-salt; and the remainder is a rough, white alkaline earth. The virtues of these waters are nearly the

same as those of *Buxton* and *Bristol*, used either internally or externally. Both drinking and bathing are good for gleans, the fluor albus, the cancer and the king's evil. Bathing is proper for rheumatisms, scurvy, and defecations of the skin. It is also used successfully in all sorts of bleedings, as well as hec tick fevers and inward ulcers, with a milk diet. It also cures the diabetes, and the bilious cholick.

Westwood is another village in this county, near *Tanderfley*, where there is a spring, which seems to be a solution of the pyrites, that generally attends pit-coal. It turns blue with Galls, and the salt separated from the earthy part of the sediment will shoot into beautiful crystals of vitriol, without any other salt. The water will cure stubborn ulcers; and particularly healed one in a Maid Servant that was very frightful: it was washed twice a day with this water, and was cured in three months.

DORSETSHIRE has only one mineral water, hitherto taken notice of, and this is at *Nottinton*, a village near *Weymouth*. The water has a strong sulphurous smell, with a flavour resembling that of boiled eggs, and the colour in a tin vessel is blue. At the fountain head a shilling put into this water, becomes of a gold colour in two or three minutes; and from various experiments it appears to be impregnated with sulphur and natron. It is remarkable for curing foulnesses of the skin, by internal use.

DURHAM. *Hartlepool* is a market-town in this Bishoprick, commodiously seated on the sea-shore, and is 15 miles south-west of *Durham*. The water found here is a chalybeate, though as it rises it discovers a little steel and sulphur, which soon flies off after it is taken up. It lets fall a white sediment with Salt of Tartar; becomes whitish

whitish with Spirit of Hartshorn, and turns of a pink-colour with Galls; but green with Syrup of Violets. A gallon yields 120 grains of sediment, whereof two parts are nitre, one sea-salt, and the rest lime-stone. The water is an excellent antiscorbutick, and cures habitual cholicks. It is good in pains of the stomach, in indigestion, in the gravel, in womens obstructions, in hypochondriack melancholy, in the cachexy, in weaknesses of the back, hectic heats, and recent ulcers.

ESSEX. Here are several mineral waters in this county, of which one is at *Upminster*, seven miles south of *Burntwood*, and eight east of *Barking*. The water is bitter, and it will curdle with Oil of Tartar, but more strongly with Spirit of Hartshorn, and will not lather with Soap. A solution of Alum, causes it to let fall a large grumous sediment, and the solution of Copperas changes it to a dark dun colour. It appears to be a sulphurous water, of a considerable strength, and a gallon will yield 332 grains of sediment, which is of a nauseous bitter taste. It is chiefly a calcarious nitre, mixed with a little natron and sea-salt. The water is purgative and diuretick, absorbs acidities, strengthens the stomach, and checks vomiting.

Whitham water, when fresh, is perfectly clear, and has a very strong chalybeate smell and taste. It has a remarkable freshness when just taken from the spring, which renders it agreeable to the taste and stomach; but after it has stood awhile, it loses that quality, and deposits a brownish sediment. A gallon by evaporation, will yield 30 grains of sediment, which will grow damp in a moist air. However, this water is of no use, unless it be drank immediately at the spring, and then it is diuretick, and is good in hectic fevers, lowness of spirits, weakness of the

nerves, and want of appetite. *Witham* is a market-town, which lies in the road between *Chelmsford* and *Colchester*.

Tilbury is a village, seated over-against *Gravesend* in *Kent*; and the water here is somewhat of a straw-colour, and has a soft smooth taste. With Oil of Tartar, it will cause no immediate precipitation, though it will curdle with Soap, but not with Milk. A gallon will yield 180 grains of sediment, of a yellowish brown colour, with a sharp taste, like that of a fixed alkali. A quart of this is a middling dose; it generally passes off by urine and perspiration. It warms the blood; is good in lowness of spirits, and is a specifick in loosenesses. It also cures fluxes of blood, and indeed all other fluxes; and is particularly good in an acidity of the stomach, and for some kinds of scurvies.

FLINTSHIRE is in *North Wales*, and *Caergile* in this county, is about seven or eight miles south by west of *Chester*. The water found here is as clear as cristal, and yet it will turn whitish with Oil of Tartar; it also turns green with Syrup of Violets, and red with Logwood. A gallon will yield 220 grains of sediment, of which 66 are earth, and 154 are sea-salt and lime-stone. It appears to be impregnated with calcarious nitre and sea-salt, and if drank to a quart or two, will purge pretty well. It has cured a woman that had a loathsome scurf all over her body, by drinking three pints of this water in a day. Likewise several children afflicted with scorbutick disorders, and the leprosy, have been cured by drinking and washing.

GLOUCESTERSHIRE has but one remarkable water, which is at *Cheltenham*, a town which lies in the road from *Gloucester* to *Warwick*. It was not much taken notice of before the year 1740, and then it was said to be the best purging water
in

in *England*; but it begins now to be neglected. It is limpid, a little brackish, and nauseously bitter. It will curdle with Soap, and lets fall a white, grumous sediment with the solution of Salt of Tartar, and with the Spirit of Sal Ammoniac. It will ferment with Oil of Vitriol, Spirit of Salt, and Vinegar: beef and mutton boiled therein will become of a pale red, and it turns of a deep green with Syrup of Violets. A gallon will yield 688 grains of sediment, which contains a little impalpable earth, mixed with a little salt, which is chiefly calcarious, and has a nauseous bitter taste. The dose is from one pint to three or four, nor is it ever attended with gripes, but creates a keen appetite. It has been used with success in the gravel, and will cure old scorbutick humours, *St. Anthony's fire*, and strumous inflammations of the eyes.

GLAMORGANSHIRE is in *North Wales*, and at *Swansey*, a sea-port town, there is a spring that has an acid stiptick taste like alum, though the predominant salt is a martial vitriol. It turns blue with Vinegar, and will not curdle with Milk. A gallon of this water yields 40 grains of sediment, of a highly acid, stiptick, vitriolick taste, and a light brown colour, which will ferment with Spirit of Hartshorn and Oil of Tartar. It is good in loosenesses, and will staunch blood externally in wounds.

HERTFORDSHIRE has two mineral Springs, at *Barnet* and *Northall*. The first is called *East Barnet*, and is situated two miles south-east of *High Barnet*. *Northall* lies three miles north of *High Barnet*, and receives its name from *Northaw*, which is the same as *North-grove*; there having been a wood here belonging to the monastery of *St. Albans*. Both the waters seem to be of the same nature; that at *Northall* is a little brackish

and bitterish in the throat; but is not so nauseous as that at *Epsom*. *Barnet* water is bitterer than the former, but they both will curdle with Soap, and let fall a grumous sediment with Oil of Tartar. With a solution of Alum they will let fall white grumes, which experiment shows they are not a luminous: but with Galls they turn of a wheyish colour; and with Logwood of a deep red. A gallon of *Northall* water will yield four drams, and twelve grains of very white sediment; and a gallon of that at *Barnet*, 20 grains of a brackish, bitter sediment. From other experiments it appears, that both these waters contain calcarious nitre, with a small mixture of sea-salt, and a little lime-stone. They have both a purging quality; but they are not half so strong as that at *Epsom*.

KENT has a remarkable mineral Water, commonly known by the name of *Tunbridge Wells*, which is 34 miles south-east of *London*. In a warm season a gas of vitriol may be perfectly distinguished in this water; and it is generally allowed to be impregnated with volatile and spirituous exhalations. It turns of a blackish purple colour at the fountain-head with Galls, Oak-leaves. and Green Tea; but if a few drops of Spirit of Vitriol be added thereto, it will become clear again. In a rainy season in *January*, a gallon will yield nine grains of sediment; but in *August* no more than six grains. It is a light, and comparative pure chalybeate, and its virtues are most powerful at the fountain-head. It causes a blackish perspiration, which in time will change the linnen of the drinkers to the same colour. It purges most by stool and urine; but if the stomach be foul by vomit. In general, it is an effectual remedy in obstructions of the glands of the mesentery, as well as in recent dropxies, as also in phlegmatick patients, whose blood is very poor.

It is good in all pains of the stomach, and in painful swellings at the pit of the stomach, though of many months standing. Its excellent in ulcers of the kidneys and bladder; and cures the cholick, vomiting, and the hiccough, and likewise kills worms. It strengthens the brain and nerves, and is good in convulsions, the head-ach, and vertigo; besides, it cures long and tedious agues, and is good in the dropsy, black and yellow jaundice, hard swellings of the spleen, the scurvy, green-sickness and fluor albus, as well as helps sore eyes and red pimples.

SYDENHAM WELLS are in the parish of *Lewisham*, and are seated upon a common near *Dulwich* in *Surry*. The water is a little bitterish; will curdle with Soap, and with the solution of Pot-ashes, it will let fall a white grumous sediment. From these, and other experiments, it appears to be impregnated with a calcarious nitre and sea-salt, joined to a little natron and calcarious earth. A quart will yield above a dram of a palish yellow sediment, with a nauseous, bitter taste; and the salt separated therefrom has the same taste, with a little brackishness. It produces much the same effects as *Epsom* water, tho' it is not half so strong.

Dulwich water has its name from rising in the hills nearly adjoining to that village in *Surry*; but in reality is in the parish of *Lewisham*, in the county of *Kent*. The water is generally clear, and has a brackish taste, with a little bitterness in the throat, and it will curdle with Soap; but with Oil of Tartar it will let fall a white grumous sediment. A gallon will yield three drams of sediment of a greyish colour, and a brackish taste, which will ferment greatly with Oil of Vitriol. This water is chiefly impregnated with sea-salt, calcarious nitre, and a little calcarious earth.

earth. It is a brisk purge, and will cure ulcers of every kind, by bathing therein, all defecations of the skin, and even leprosy itself. It is good in obstructions of the bowels, in the green-sickness, black and yellow jaundice, the cholick, gravel, piles, cachexy, scurvy, and removes difficulty and sharpness of urine, as well as strengthens the brain and nerves. The dose is three pints a day at first; but should be increased every day till it comes to eight or nine pints.

LANCASHIRE has several mineral Springs, among which is *Carlton Water*, so called from *Carlton*, a village ten miles south-west of *Preston*. This water is somewhat of a chalybeate, and when just taken up has a faint smell of sulphur. It will curdle with Soap and Milk, turns white with Oil of Tartar, has a pink sediment with Galls, and changes to a deep blue with Logwood. A gallon contains 236 grains of a white sediment, whereof one third part is earth. The sediment is of a brackish taste, and bitterish in the throat, and will ferment with acids. The salt is brackish and very bitterish in the throat, and it emits an acid fume with Oil of Vitriol; but will not ferment nor change with Vinegar: it is a more powerful absorbent than many other nitrous waters, and three or four pints will purge briskly.

Rougham Water, so called from *Rougham*, a village in *Lancashire*, two or three miles from *Cartmel*. The spring rises from the bottom of a rocky mountain, and the taste of the water is a little brackish: it turns white with Oil of Vitriol, green with Syrup of Violets, and brown with Logwood; but it continues clear with Galls. A gallon of this water yields 300 grains of sediment, of a saltish taste, and will ferment with Oil of Vitriol, and emit an acid fume. The
water

water purges briskly by stool and urine, and the common people drink it from three to eight quarts. It is of great use in bad digestions, loss of appetite, and the scurvy. It has cured the jaundice and a quartan ague; and is excellent in the green sickness.

Crickle Spaw, rises in a village of that name, a mile from *Broughton*. It has a strong fetid smell, and will turn Silver black in a minute. The earth it runs over is of a shining black, and yet it will turn rags, leaves, and grass, white. A gallon contains 320 grains of sediment, 12 of which are earth, and the rest are sea-salt and nitre. It is a purging, sulphureous water.

Heigh, is a village not far from *Wigan*, where there is a water, which will ferment strongly with any alcali, and it will turn inky with Galls, and has likewise a vitriolick taste; a gallon yields four ounces of sediment, which consists of a variegation of white and green, with oker, sulphur, and a little copper. It works plentifully by vomit and stool, and will stop any internal bleeding.

Burnly is a town also in *Lancashire*, whose waters will turn Galls of a deep red in a moment, and with Syrup of Violets to a very deep green. It works powerfully by urine; and is good in scorbutick cases.

Handbridge is seated between *Burnly* and *Townly*, and there's a spring that will change Galls to a faint orange colour. The salt obtained therefrom, yields a fetid, penetrating smell with salt of tartar. These two last Waters, agree with the *Pohun* at *Spa*, in containing iron and natron as their principal ingredients. It purges by stool and urine, and is of great use in the gravel, scurvy, obstructions, and diseases from an acid.

At *Ancliff*, a village three miles from *Wigan*, there is a Spring called the *Burning Well*, which will

will take fire, by holding a lighted candle near it. It will continue a whole day, and eggs and flesh may be boiled therein; but the water itself is cold. It is but a few yards distant from a rich coal mine, which renders it probable, that the inflammable vapour is rock oil.

There is a Spring two miles from *Whaley*, seven miles west of *Burnly*, whose stream renders Gold brighter; but turns all white metals black. The channel this water runs in, is lined with a bituminous, stinking substance; and it is strongly impregnated with sulphur, combined with a little calcarious nitre, a mixture of sea-salt, and of absorbent earth; but we have no account of its virtues.

Inglewhite is a village in *Lancashire*, where there is a strong, sulphurous and chalybeate water, which is the product of marle. This partly resembles slate, and will moulder, when exposed to the air into exceeding thin flakes, like leaves of fine paper, and will afterwards turn to a black powder. A gallon contains 24 grains of sediment, of which 19 are earth and oker, and five nitre; but it will not purge, unless drank with salt.

LEICESTERSHIRE has one remarkable mineral Spring at *Nevil-Holt*, a village seated to the south of *Market Harborough*: the water is exceeding fine and clear, and it has a styptick, bitter, sweetish and sub-acid taste, leaving the mouth somewhat dry. It is uncommonly brisk and sharp, when drank at the Spring-head; and then also it passes quicker than elsewhere: it curdles with soap; lets fall a gross, white sediment with Oil of Tartar, but with the solution of Alum and Copperas, it will continue clear. Hence, and from other experiments, it appears to contain a calcarious nitre and allum, with a fat clay, a latent sulphur, and sometimes a little oker. It will cure externally
fresh

fresh wounds, and all sorts of ulcers ; and is excellent for the eyes : used outwardly, and taken inwardly, it will cure hec tick ulcers. When taken inwardly, as an alterative ; an ounce or two may be taken five or six times a day, or four ounces night and morning ; but when designed as a purge, it must be taken from one pint to three. If the constitution is cold and phlegmatick, it will be necessary to add four spoonfuls of brandy, and an ounce of sugar to each bottle of water. It is excellent in bloated, dropical constitutions : it has no parallel in all sorts of hæmorrhages, as well as in all great and natural secretions, of what kind soever. It also cures an inflammation of the lungs, attended with a cough and spitting of blood. It is very successful in the King's Evil, hidden cancers, as well as scrophulous inflammations of the eyes of many years standing. It also cures all diseases of the skin, and has had surprizing success against rheumatisms ; but it must not be drank in the increase and height of any internal inflammation.

LINCOLNSHIRE has several mineral springs, whereof one is at *Cawthorp*, a village seven miles north-east of *Stamford*, where the spring rises up in a large basin, in the middle of the street. It will turn very white with Oil of Tartar, and afterwards let fall a yellow sediment ; but it will turn green with Spirit of Hartshorn. A pint will yield a scruple of a white sediment, whereof near one half is salt, and the other earth. It is a purging chalybeate, and is probably a great corrector of acidity.

In the parish of *Strenfield*, ten miles east of *Lincoln*, there is a water that is pleasant and sweet to the taste ; but will curdle with Soap, and turns to a pearl colour with Oil of Tartar. A gallon of it contains four scruples of a white sediment, whereof

whereof 44 grains are earth, 30 nitre, and eight sea-salt. It is found effectual in curing obstinate fluxes, and the diabetes; as also all internal hæmorrhages, and profuse night sweats.

Gainsborough is a market-town in *Lincolnshire*, seated on the river *Trent*, 14 miles north-west of *Lincoln*. The spring rises to the south-east of the town, and smells and tastes like steel and sulphur. A gallon yields 192 grains of sediment, whereof 120 are earth, and 72 calcarious nitre: it has somewhat of a purgative quality.

MIDDLESEX contains several mineral waters, of which one is at *Acton*, a large village, eight miles west of *London*, which is a purging-water, though it is very clear and without smell. The taste is a little nauseous, like a weak solution of *Epsom* salt: it will curdle with Soap; and with Salt of Tartar it produces a white grumous cloud. Oil of Vitriol and Spirit of Salt, will excite a small fermentation; and with Syrup of Violets it will turn to a light green. A gallon will yield 344 grains of sediment, it is very white, and of a nauseous bitter taste: it will ferment very briskly with Spirit of Salt; and the proportion of the salt to the earthy matter, is as 73 to 4: and from other experiments it appears, that this water is chiefly impregnated with a calcarious nitre, and a small proportion of absorbent earth. It is accounted one of the strongest purging waters near *London*, and is noted for causing a great soreness in *Ano*.

Pancras lies on the north-west side of *London*, and in the road to *Kentish-town*: the water here has scarce any taste, till one half is evaporated, and then it becomes bitter; with Oil of Tartar it will deposite a copious white sediment; but with the solution of Alum there will be a small grumosity. Acid spirits will produce a small fermentation; and

and with Syrup of Violets it will turn green. A gallon will yield five drams of a whitish sediment, which has a saltish and strongly bitter taste in the throat, from hence it is concluded, that the impregnating salt is a calcarious nitre, and it is considerable diuretick, and somewhat purgative.

Shadwell Water is found in the *Sun Tavern Fields*, about two miles eastward of the *Tower of London*, and about half a mile from the river *Thames*. It is of an amber colour, with a strongly acid and styptick taste. It ferments for some time with Oil of Tartar, and lets fall a large ochreous sediment; but with the solution of Alum it continues clear. It will turn a copper half-penny black on the surface, and a knife black, blue and rusty. A gallon contain 1320 grains of a white and yellowish sediment, which has a highly acid and austere taste. The predominant salt of this water is highly acid and vitriolick, with a combination of sulphur. This water has been chiefly used externally; but if a pint of it be drank at twice, in the space of an hour, it will procure a gentle vomiting, and two or three stools: it has done a great deal of good in all diseases of the skin; and some say it will cure fistulas, stubborn ulcers in the legs, and sore eyes, by dipping linnen rags in the water, and applying them to the parts affected: taken inwardly, it stopped internal bleedings, and has perfected the recovery from camp dysenteries.

Hampstead is well known to be a large village, or rather town, five miles north of *London*; and the water that is found there, was formerly in as great reputation, as that at *Tunbridge*. It will lather with Soap, but undergoes no alteration with Spirit of Hartshorn; and yet it will ferment with Oil of Vitriol, and grow warm and smoak. It will keep milk sweet for four days, and will
turn

turn purple with Syrup of Violets; likewise with half a grain of Galls grated, it will turn of a fine deep purple. A gallon will yield about five or six grains of a kind of saline concretion, mixed with a yellowish earth; that will taste somewhat like vitriol of steel. It works chiefly by urine, and has been found good in want of appetite and indigestion: it is also good in vomitings, cholicks, nervous and hysterical disorders, raising the spirits greatly. It is serviceable in the flour albus, in weakness from miscarriages, and in the scurvy and all diseases in the skin: it is proper in obstructions of the mesentery, bladder and skin; and also in some paralytick disorders.

New Tunbridge-Wells, are near the *New-River-Head*, at the entrance of *Islington*, on the side next *London*. The water has the taste of iron, and is a little styptick, with some degree of quickness both in smell and taste, especially in the summer season. It will lather with Soap, and turn a little milky with a large proportion of Oil of Tartar; but it will not let fall any sediment with volatile alcalies. A gallon will yield from 10 to 30 grains of a reddish earth, which will ferment with Oil of Vitriol. It is a light and comparatively pure chalybeate, of considerable strength at the fountain head, where it ought to be drank. It is of great efficacy in all nervous disorders, and restores the strength after violent acute diseases: it opens all obstructions in women, and is excellent in a dropfy; in which case the dose is from half a pint to a pint and no more. It opens obstructions of the glands, and is of some service in reducing corpulent habits.

NORFOLK has but one remarkable mineral Spring, which is at *Thetford*, a market-town of great antiquity: the water appears to have somewhat of iron; for Galls will turn it first purple, and

and then black. It will let fall spontaneously a dram of an earthy substance of the colour of oker, which being calcined in a crucible, some of its particles may be attracted by a loadstone. From other experiments, it appeared to be impregnated with iron, sulphur and natron; and it works gently by stool and urine, and sharpens the appetite: it restores lost strength, and cures pains of the stomach, and of the head, as well as fainting, vomiting, convulsions, and indigestions, difficulty of breathing, and the beginning of a consumption; it also kills worms.

NORTHAMPTONSHIRE has 3 mineral Springs, whereof one is at *King's-cliff*, eight miles south of *Stamford*, and it both smells and tastes of iron. It will let fall a white sediment with Oil of Tartar; and with Galls it precipitates a purple sediment; but turns of an opaque red with Logwood, and of a deep green with Syrup of Violets. A gallon yields 140 grains of sediment, 75 of which are limestone and oker, and 65 a calcarious nitre. From various experiments it appears, that this water is of a chalybeate, laxative nature, impregnated with iron and calcarious nitre, with a small quantity of sea-salt, and a calcarious earthy substance. It will not purge a strong person, unless he drinks from three to five quarts; but it has been used with great success, in disorders from obstructions, and in eruptions of the skin; it has also cured several lame persons.

Astrep is a village in this county, four miles south-east from *Banbury* in *Oxfordshire*; and the mineral water here is a brisk, spirituous, clear, and well-tasted chalybeate. It lets fall a white sediment with Oil of Tartar; and a gallon after evaporation, yields 17 grains of sediment, containing nitre and calcarious earth. Drank at the fountain head, it is a certain cure for all female obstructions,

obstructions, and in the first and second stages of consumptions. It seldom fails in the jaundice and beginning of a dropfy; and it restores a constitution weakened by hard drinking: the dose is very large, that is, from three quarts to five in the forenoon; and some affirm it will cure madness and melancholy.

In the parish of *King's-Sutton*, four miles south by east of *Banbury* in *Oxfordshire*, there is a mineral Spring, that has an intolerable strong smell like rotten eggs; but the taste is saltish, warm and pungent, like Salt of Tartar. A gallon yields 166 grains of sediment, of which nine are earth, and the rest salt, of a pungent, brackish and bitter taste, with all the characteristicks of an Alkali. It is a purging water, strongly impregnated with sulphur, and an alkaline salt mixed with sea-salt. It is famous for discussing and healing of tumours, ulcers, and all diseases of the skin.

NOTTINGHAMSHIRE has a mineral Water at *Kinalton*, nine mile south-east of *Nottingham*. It is clear, pleasant, cooling, and a little saltish; it grows white and curdles with Oil of Tartar; but undergoes no alteration with acid spirits, and will turn of a beautiful light red with Tincture of Logwood. A gallon will yield 280 grains of a beautiful white sediment, the fourth part of which is a fine alkaline earth; and in the remainder is a remarkable pure, clear nitre. This is a purging water, that has not above half the portion of contents as *Epsom* water, nor will it work unless drank plentifully.

At *Orston*, 12 miles east of *Nottingham*, there is a mineral Water, which as it rises out of the spring, has a sweetish chalybeate, and a little roughish taste; but when it has stood for some time, it becomes rough and harsh. A gallon yields

yields 128 grains of sediment, of which the proportion of the earth to the salt, is as 27 to 9. The Water is a rich chalybeate, with a considerable quantity of sulphur, if drank as it springs up; but the predominating salt is a calcarious nitre. mixed with a small quantity of sea-salt. It will purge those of a gross habit of body, and will turn the throat, tongue and stools of the drinkers perfectly black. It is good in the hypocondriack melancholy, scurvy, want of appetite, indigestion, pain of the stomach, costiveness and stoppage of urine. It is also good in the beginning of obstructions of the bowels, and likewise in ulcers of the lungs, and spitting of blood.

In OXFORDSHIRE there is *Chadlington Water*, in a village of that name, three miles south of *Chipping Norton*. It smells like the washings of a foul gun, and a gallon yields 90 grains of sediment, of which seven are earth, and the rest a peculiar sort of nitre. From other experiments its found impregnated with sulphur, and an alkaline salt mixed with sea-salt: it is accounted a purging water.

Clifton is a village two miles east of *Doddington*, where there is a clear water that has little taste, which yields a peculiar kind of nitre, inclinable to an alkali. It is laxative, and is used to cure diseases of the skin in men and cattle, by bathing therein.

Doddington is a small market-town 16 miles north of *Oxford*, where there is a strong sulphurous water, that smells like the washings of a foul gun. A gallon yields 87 grains of sediment, whereof 44 are earth, and 43 salt. It is impregnated with sulphur and iron, both of which are very volatile; besides which, it has salt enough to give it a purgative quality.

RADNORSHIRE in *South Wales*, has very remarkable mineral Waters at *Llandridod*, which is 24 miles west of *Lempster* in *Herefordshire*. Here there is a common six miles long and three quarters broad, and in that part of it lying in the above parish, are the mineral Springs. These are the saline pump-water, the sulphureous water, and the chalybeate rock-water. The air is exceeding healthy, infomuch that weak and consumptive people that come here to drink the waters, soon revive and gather strength. These Springs are now frequented by very genteel company, and in the summer-time, the common people resort here in crouds.

The *Rock-water* is so called, because it issues out of a rock, and a glass of it taken up in a clean warm day, is as bright as crystal; but after it has stood some time, it changes to a pearl-colour. While it continues clear it has a strong chalybeate taste and smell, but they forsake it as it changes colour: at the spring head, it turns to a deep purple with powder of Galls, and becomes hot with Oil of Vitriol. However, it will not curdle Milk; but with Oil of Tartar it becomes as white as milk, which afterwards changes to a yellowish green. It preserves its transparency with acid spirits; but with Sugar of Lead it turns first milk white, and at length lets fall a yellowish grey sediment, from a quart of water, which after it has been analysed, is found to contain about 15 grains of crocus of iron, and about five of the bituminous mucilage of iron. From hence, and various other experiments, it is concluded that this water contains iron, salt, sulphur and vitriol. Its good in all chronick distempers proceeding from a laxity of the fibres, and particularly in scorbutick eruptions and weakness of the nerves, and disorders proceeding from the brain.

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It is also efficacious in obstinate agues, obstructions of the bowels, slow nervous fevers, and in all female disorders.

The saline purging water, is called upon the spot the *Pump-water*, and from various experiments it appears to contain a neutral salt like native borax, a small quantity of bitumen, and an ethereal, elastick, volatile mineral spirit, and a mineral oil. It is excellent in all diseases of the skin, and in such disorders as proceed from corrupt humours; but if the disease is obstinate, it requires some time to cure it radically. Persons troubled with the scurvy, must use the water both as a purgative and alterative; and for the last a pint and a half should be taken at three doses, in the morning before breakfast. As a purge, half a pint must be drank at a time, till it begins to work. In diseases of the skin the patient must bath frequently, and wash the parts affected with the water, and particularly in the leprosy so much water must be drank, as to cause two or three motions every day; to which must be joined bathing twice a week in a warm bath, made with equal quantities of the pump and sulphurous waters. In the gravel, the patient must drink so much as will give him two or three stools, and when the gravel is discharged by this means, the patient must drink every morning half a pint of the rock water, and half a pint of the pump-water, and half the quantity going to bed.

The *Sulphurous Water*, commonly called the Black stinking Water, has its name from the strong smell, and the blackness of the channel through which it passes. It smells like the washings of a foul gun, and has the strongest smell in rainy weather. From various experiments, it appears to contain ethereal, volatile, mineral spirits, a small quantity of a vitriolick acid, a mineral, unctuous

unctuous mucus, a fine mineral oil, a subtile crocus, a perfect sulphur, and a neutral salt, of a briny, calcarious nature. It is of great use in all cases, where bathing is proper, made into a luke-warm bath. It is excellent in benumbed limbs, in wasting of the flesh, and in nervous disorders; as also in venereal complaints, old sores, tetters, and in all diseases of the skin; as well as in the stone, gravel, rheumatism, and gouty distempers. Drank inwardly, and used outwardly, it cures the King's Evil, and is an excellent absorbent; insomuch that it is efficacious in foreness of stomach, obstructions of the liver, and in the jaundice: it is also good in contractions and weakneses of the limbs, and in broken constitutions from hard drinking. The dose cannot be determined, and therefore it is best to begin with drinking from a pint to a quart in a morning, that is about half a pint at a time, with short intervals between the draughts: the quantity may be increased to as much as the constitution will well bear, that is as much as will sit easy on the stomach, and pass off well.

SOMERSETSHIRE is remarkable for having two of the most noted mineral Waters in the kingdom, that is at *Bristol* and *Bath*, besides others of different kinds: that at *Bristol* issues out of a rock, and in that city is called the Hot-well Water. It is seated on the north side of the river *Avon*, where there is a romantick and beautiful prospect. When first drawn off, it is of a whitish colour, at least sometimes, which it loses gradually as it grows cold, and many small bubbles arise in it when taken from the pump. The taste is exceeding soft, pleasant and milky, at the spring head, and is very agreeable to the stomach; but it leaves a sort of stipticity on the palate. It is entirely without smell, and is only lukewarm to the touch.

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It keeps well in bottles that are well stopped, losing only a part of the elastick air, which flies off before the corks can be put in.

With regard to chymical experiments; if a glass of water is poured upon a few grains of Sal Ammoniac, it immediately dissolves it, with a very sensible effervescence. Oil of Tartar, not only produces the same effect, but renders the water milky, which after it has stood awhile goes off, and lets fall a light earthy precipitate. Dissolved Soap, dropped into a glass of water, immediately curdles, and in a short time the surface is covered with a greasy substance, and the water below becomes turbid. Twenty drops of the Solution of Silver, mixed with three ounces of the fresh water, in three hours made it appear, as if a small quantity of ink had been dropped therein.

These, and other experiments, seem to declare there is some degree of an acid in the *Bristol* water, though not discoverable by the taste; there is also a small portion of sulphur, because when bottles filled with this water happen to be broken, 'twill stink very much. A gallon contains about 34 grains of sediment, which is of a light grey colour, of a brackish taste, and bitter in the throat. This will ferment with acids, and turn green after some time, with Syrup of Violets. The salt is white, but will not ferment with distilled vinegar; and in the air it will grow damp.

Bristol water is generally allowed to be cooling, cleansing and balsamick, with a considerable degree of astringency, which renders it excellent in the diabetes: it will also open the urinary passages, obstructed by gravel. It is useful in many chronick diseases, yet will not yield to a common course of medicine, and it is serviceable in many internal inflammations. It strengthens the stomach, promotes an appetite, assists digestion,

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and will cure the first stages of a consumption. It is good in disorders of the eyes, and will cure ulcers therein, if taken warm from the pump, and applied with a soft rag: it has also cured many scrophulous ulcers, by washing them in this water, others say those of the cancerous kind, drinking the water at the same time: it has also been found successful in the bloody-flux, all internal ulcers, and preternatural discharges, and bleedings of every kind.

The method of drinking the water when the patient first comes down, is to go to the pump-room in the morning, and drink a glass or two before breakfast, as also about five in the afternoon; the next day the patient takes three glasses before breakfast, and three in the afternoon; and this course is continued during his stay at the Hot Wells.

Bath water when viewed by itself in a small quantity, appears clear and transparent; but when beheld in the Bath, the surface is of a sea-green colour. The smell is not very agreeable, especially in the Hot Bath; but when quite fresh it has a soft and milky taste. There are four Baths in this city, which differ from each other, chiefly in their degree of heat, namely, the *Cross-Bath*, the *Hot-Bath*, the *King's-Bath* and the *Queen's-Bath*.

With regard to the experiments made with it, it is observable that when carried at a distance from *Bath*, it will precipitate Silver out of Spirit of Nitre, into a hardish curd; but not so much as common salt: however, it is concluded from hence by some, that sea-salt predominates in *Bath* water. The *King's-Bath* and *Hot-Bath*, will turn the solution of Silver white, with a bluish cast, which becomes gradually more dusk-coloured, and then deposits a dark grey sediment. The
solution

solution of *English* Vitriol, mixed with this water turns to a pearl-colour; that is, with the *King's-Bath* and *Hot-Bath*, and both will be covered with a thin variegated pellicle. With Oil of Vitriol and other acids, the *Bath* waters will excite some intestine motion, and greatly blunt the acidity. If one part of boiling Milk be mixed with two parts of *Bath* water, a thin whey and curd will appear, if the water be just taken up. A dram of Syrup of Violets, will give a grass-green colour to an ounce of the *King's-Bath* water, as well as of the *Hot-Bath* in 24 hours time.

Some experiments shew, there's a vitriolick principle in the *Bath* waters; for if it be taken fresh from the pump, in clear frosty weather, Galls will tinge it of a purple colour; but when cold, they scarce make any alteration at all. It is generally thought to be owing to the ferruginous principle of *Bath* water, that it will make better and blacker ink, than common water. Likewise the sand of the Baths, exposed to the air for some time, will become vitriolick, and make ink with infusion of Galls. That there is an oker in this water, appears from the yellow colour of the stones in the bottom of the Bath; and from the yellow matter like thin cream floating on the surface of the water, in the winter time.

From these and other experiments it is concluded, that there is a mixture of calcarious substance with the oker; and the mud is found to consist of a bluish clay, with some testaceous particles; and when it has been used as a cataplasm, it has somewhat of the smell of sulphur, and when rubbed on silver it changes it black. The sand thrown on a red hot iron, emits a blue flame with a sulphureous smell, and being exposed to the air becomes vitriolick, as before observed.

A gallon of the *Queen's-Bath* water will yield 155 grains of sediment; the *Hot-Bath* 139, and the *Grofs-Bath* 130. The quantity of a calcarious and argillaceous substance, is double to that of the saline, the quantity of salt in each gallon scarce exceeds 43 grains, and the rest of the matter is a grit, with a blue sulphureous earth or marl. The gross remainder emits a strong sulphureous smell, with a blue flame upon calcination; and by this operation a fourth part of the weight is lost, by burning away. The result of all the observations of different Physicians plainly show, that the minerals in *Bath* water, consist of a calcarious and marly earth and oker, a marine or sea-salt, a little calcarious nitre, a gas of vitriol, a little bitumen, and a very small quantity of sulphur, which last can be made to appear no otherwise, than by consequenecs.

The *Bath* Physicians are agreed, that the *Bath* waters are useful, in all diseases of the head and nerves, such as convulsions, palsies and epilepsies; and in all diseases of the skin, obstructions of the bowels; in scirrhusities of the liver, spleen and mesentery; in most diseases of women, and in the scurvy and stone. The *Bath* waters are certainly a most powerful deobstruent, and their energy is so great, and their operation so sudden, that a very exact preparation of the body is required, and a stricter regimen than in drinking other waters. Likewise a regard must be had to the habit of body, the season of the year, the symptoms of the disease, the changes of the weather, and the different degrees of heat in the several Baths. As for instance, the heat of the *King's-Bath*, without due precautions, is apt to inflame the blood, heat the bowels, and sometimes cause a fit of the gout. As to the manner of the operation of *Bath* waters, whether by bathing or drinking

drinking, or both, their effects are thus enumerated. Externally, they will heat, dry, attenuate, resolve and strengthen; have a singular virtue in diseases from a cold and moist cause. They ease pains, disperse cold tumours, dry up moist ulcers, and are very advantageous in phlegmatick diseases. 'Tis also remarkable, that nothing more effectually prevents too great a corpulency than the frequent use of these Baths. Bathing cures contractions and relaxations of the limbs, restoring lost sense and motion; but it is not proper in a fit of the gout; but in the decline of that distemper it is. It is also highly serviceable to those, whose sinews are impaired and crippled, by the severe fits, and their frequent returns.

The *Bath* waters taken inwardly, to two or three quarts, commonly give two or three stools extraordinary; and it is remarked of the *Hot-Bath*, that it generally keeps the body open, while the *King's-Bath* has a contrary effect. When they are used as an alterative. they dilute, attenuate, sweeten, strengthen and heal, correcting the acrimony of the first passages, and curing the many disorders of those parts. They supply a want of spirits, and are good in diseases, where the secretions are diminished; as well as in all cachectick and scorbutic habits of body. They are very successful in hypocondriack disorders, and melancholy, as well as in disorders of the urinary passages, particularly sharpness of urine, the strangury, gravel and ulcers of the bladder. The usual time of bathing and drinking these waters, is generally five or six weeks, and in obstinate cases, they must be repeated every year. The common quantity drank, is from a pint to a quart and half a pint a day; but some have been allowed to drink a gallon every day; and then the patient must begin with small doses.

Alford is a village 24 miles south of *Bath*, and is remarkable for its mineral water, which has a nauseous bitter taste, and will curdle with soap, as well as yield a white grumous sediment with the solution of Pot-ashes. It turns of a dilute green with Syrup of Violets, and Galls will produce a greenish cloud on the surface, which descends deeper in two or three days. A gallon will yield six drams of sediment, consisting of calcareous nitre and sea-salt, with a little lime-stone. It is cooling, cleansing, and penetrating, will attenuate gross humours, destroy acrimony and temperate ebullitions of the blood; hence it is good in the scurvy, jaundice, and all sorts of obstructions. It cleanses the urinary passages, purges briskly and promotes urine and sweat.

Lincomb Water is seated near *Bath*, and the water is by some called *Lincomb Spaw*. When first taken up, it has a light, brisk, sulphureous smell, which it looses in six or eight minutes time; but its taste of iron is more lasting, that is, for the space of eight hours. It is transparent at first, but becomes bluish with standing, and throws up to the surface, a thin, variegated unctuous scum. From various experiments it appears, that this water is impregnated with iron and a little sulphur, as also with bitumen, and a small quantity of alkaline salt. It passes off quickly by urine, mends the appetite, and raises the spirits. It is serviceable in disorders of the first passages, and is good in cachexies, the jaundice, and recent obstructions of the liver: it also deterges and heals ulcers of the kidneys, and removes the strangury. Outwardly, it cleanses and heals scrophulous ulcers, dries up sharp humours, and cures foulnesses of the skin.

Queen's-camel is a village five miles north of *Sherborne*, where there is a spring that proceeds from

from a hard rocky bank, and is called the *Black-Well*. It smells like the washings of a foul gun, and from the trials made with it, appears to contain a considerable quantity of sulphur, some natron, and a calcarious earth. It cures by bathing scorbutick, leprous and scrophulous disorders; and it has been observed to cure dogs of the mange, by dipping them therein.

STAFFORDSHIRE has only three mineral waters, whose virtues are ascertained, one of which is at *Codsall*, a village 12 miles south-west of *Stafford*, that is in the wood adjoining thereto which is a sulphureous spring, and the sulphur is mixed with salt, but not sufficient to restrain the volatility of the sulphur, so that in the winter against rain, it may be smelled twenty yards off. It will lather with Soap; will not curdle Milk, and with Syrup of Violets it will turn green; but neither Galls, Oak-leaves, nor a solution of Sublimated Tartar would throw down the sulphur: however, Spirit of Urine did, and turned it of a faintish red. When leprosy was more frequent, this water was famous for curing them; but at present it is only used against scabs and the itch, and it operates both by stool and urine. They brew their beer with this water, and in Dr. Plot's time there was a house, called the *Brimstone-Alehouse*, where no one that lived there, was troubled with diseases of the skin.

St. *Erasmus's-Well* is in the grounds belonging to the Lord *Chetwynd*, near *Ingestre*, two miles from *Stafford*. The water is clear, and of the colour of Sack, but has no remarkable taste, nor smell. A gallon of this water will yield 300 grains of sediment, whereof 272 are salt, and the rest moss. We are not told what diseases it is used for, nor indeed that it is used at all.

Willoughbridge is six miles north-east of *Drayton* in *Shropshire*, and in the park near it there is a well, whose water is as clear as chrystal; but it renders the sides of the glasses, after they have been used awhile a little oily, and of a bright yellow colour. If a few drops of a Solution of Sublimate be let fall into this water, it presently becomes of a deep sack-colour, which seems to shew it has somewhat of a lixivial salt. It will lather with Soap, but will not curdle with Milk, nor change colour with Syrup of Violets. Contrary to most other waters, it leaves nothing behind it, after the evaporation of several gallons. Its oil or sulphur is so very volatile, that when distilled in a glass body and head, the Oil of Sulphur comes over the helm, upon the first heat, and is always in the receiver, before the least drop of water appears. There is such plenty of this water, that at least 60 Springs have been counted, that send forth plentiful streams. Dr. *Plot* informs us, that these waters have performed many wonderful cures, which he attributes to its balsamick virtue, and its great subtilty and volatility; and he farther adds, if we were to judge of the waters, from the many attested cures, it bids as fair for an universal medicine, as any thing else in the world.

SHROPSHIRE has a mineral water at *Moreton*, a village two miles west of *Market Drayton*, which will not lather with Soap, but it curdles Milk, and yields a white sediment with Oil of Tartar; it turns green with Syrup of Violets, and scarlet with Logwood. A gallon of this water will yield 277 grains of sediment, whereof 76 is earth, and the rest a calcarious nitre. It is an excellent cooling, diuretick and cathartick, and purges very briskly. It bears a great resemblance to *Holt* water, only the taste is more pungent, and consequently

sequently it is very likely to have the same virtues.

Pitchford is a village six miles south by east of *Shrewsbury*, which takes its name from the pitchy spring that is found here, on the top of which there floats a liquid bitumen, though it is scummed off every day. It is found to be excellent for wounds, and will cure inveterate scrophulous ulcers.

Broseley is a village four miles north-east of *Wenlock*, and has a burning Well, which was discovered about the year 1711. A candle being put down into the well, it will take fire at the distance of a quarter of a yard, darting and flashing in a violent manner, to the height of 1820 inches. It is hotter than common fire, and boils any thing much sooner. It appears to be impregnated with a sort of liquid bitumen; it ceased burning in 1752, but whether it has recovered this faculty since or no, is uncertain.

In *SURRY* there are several mineral waters, the most famous of which is at *Epsom*, which is a town about 15 miles south-west of *London*. The water is pretty clear and without smell; but if it be kept in covered vessels for some weeks in summer, it will stink, and acquire a nauseous bitter taste, with somewhat of a maukish saltiness. It will curdle with Soap and Salt of Tartar; and with Spirit of Sal Ammoniac, it will let fall a grumous sediment; but if mixed with lime-water, it will continue clear. A gallon will yield an ounce, sometimes an ounce and a half of a sort of cream and sediment, which is of a greyish colour, almost impalpable, of a brackish, nauseously bitter taste, and an odd strong flavour. There are about eight parts of salt to one of earth, the former of which is of a whitish yellow colour, and of a singular strong smell, with a nauseous bitter taste.

All Authors agree, that the chryftals of this falt will require but a ſmall proportion of water to diſſolve them, for an equal weight has been found ſufficient. The falt has a purging quality, for half an ounce diſſolved in ſpring water, will work like other phyſick. The water itſelf is a diluent, and a mild abſorbent : it is alſo diuretick and cathartick. Poor people formerly uſed to waſh old ſores with the water, with a good effect. A doſe of the water in ſummer, is two-thirds of a pint, and in the winter half a pint.

Stoke is a village two miles ſouth of *Cobham*, where there is a ſpring commonly called *Jeſſop's-Well*. This water is thought to contain more falt than any purging water in *England*, and it has a taſte much like that of *Epfom-Wells*. A gallon of this water yields an ounce and a half, with 22 grains of ſediment, that is, 742 grains in all. It is very white, and has ſomewhat of a brackiſh taſte, with a nauſeous bitterneſs. The earthy matter bears but a ſmall proportion to the falt ; which, as *Dr. Hales* informs us, will ſhoot into very bitter, irregular oblong chryſtals ; ſome of which have retained their former firmneſs, for five years at leaſt. Half an ounce of diſtilled water will diſſolve only 10 grains of falt, though ſtanding by the fire-ſide ; in which it greatly differs from that at *Epfom*. From the experiments made with it, it appears, that this water contains a large proportion of calcarious nitre, a little falt and calcarious earth, and very probably a little natron. A leſs quantity will ſuffice for a doſe than of any other ; for which reaſon it ſits better on the ſtomach, and enlivens the ſpirits of thoſe that drink it. It has been long noted for a good purging water ; and a ſingle quart will purge pretty briskly, and promote plenty of urine without gripes. It cures obſtinate ſcorbutick caſes ;
and

and as some think, there is a fine volatile spirit in the water: it may be drank for a considerable time, as an alterative with happy consequences.

Stretham is a village six miles south of *London*, that has been long remarkable for its medicinal spring. The water has somewhat of a yellowish tinge, and throws up a scum variegated with copper, blue and green colours. At the spring head it has a saline nauseous taste, and a gallon will yield 200 grains of sediment, the salt of which has a penetrating, brackish taste, with a strong flavour; and in the air it will almost melt. This is partly marine and partly nitre, enveloped with a little sulphur, and a greater proportion of absorbent earth. When it was most in vogue, three pints boiled to a pint and a half, was given as a purge; for it operates both by stool and urine, and it has been found good in disorders of the eyes.

The *Dog-and-Duck* is a noted publick house in *St. George's-Fields*, and in the parish of *Lambeth* near *London*. It is greatly resorted to in the spring and summer; and there has been lately a large room built for the diversion and entertainment of the drinkers. The water is clear, and has very little taste; but a gallon will yield 200 grains of sediment, of a dirty colour, and a pungent, brackish taste. The earthy matter is as one to twelve, in proportion to the salt, and it will ferment strongly with Spirit of Salt and Spirit of Vitriol; but will not turn to perfect lime by calcination. This water has been noted for curing leprous disorders; and some have affirmed, that it cured an ulcerated cancer in the breast by drinking the water, and keeping a cloth wet in it, always over it. Being drank from one pint to three, it generally purges easily and briskly, without affecting the strength, unless in very tender

tender constitutions. It may be taken as an alterative, instead of common drink, for the cure of scorbutick pimples, tetters, the leprosy, and the King's Evil. It is also a palliative cure in cancerous disorders, and has been the means of prolonging the lives of several. The only fault of this water is, its being too cooling, for which reason it is prejudicial to persons of phlegmatick constitutions, and of weak habits of body.

Cobham is a town seated in the road between *London* and *Guilford*, and is seven miles south-west of *Kingston*. The water has a sensible taste of iron; and a gallon will yield seven grains of a substance like oker, which a load-stone will attract, without calcination. It is a strong chalybeate, and deserves to be more known.

WARWICKSHIRE has two mineral Springs, one of which is at *Lemington*, three miles south-west of *Dunchurch*, and the spring is of a saline nature. A gallon yields 960 grains of sediment, 30 whereof are calcarious nitre, and the rest sea-salt. It is a strong purge and vomit, and is drank by labouring people from two quarts to three. It is noted for curing sore legs, diseases of the skin, and dogs of the mange.

Ilmington is a village seven miles south of *Stratford* upon *Avon*, and the water found here, though it has a brackish taste, is one of the strongest chalybeates in *England*. It sparkles at the spring head like bottled cyder; but it will not curdle with Milk, and yet Oil of Tartar will procure a small coagulum. It will turn purple or black with Galls, according to the quantity; but with Syrup of Violets it changes to a green. A quart of water will yield near a spoonful of a reddish white powder, that will ferment and fume with acids. Those that drink this water, have their stools tinged blackish; and though it generally operates

operates by urine, it will sometimes purge. Internally, it is good in the scurvy, obstructions of the bowels, the jaundice and beginning of the dropsy ; it is also good in the strangury, and difficulty of making water.

WESTMORELAND has a mineral Water at *Kirkby-Thower*, a village eight miles east of *Penrith*, which is a weak purging chalybeate. It is exceeding clear, sweetish, and has a little taste of tea. It grows whitish with alcalies, and turns to a clear purple with the Solution of Silver ; but it becomes of a pink purple with Galls, a red purple with Logwood, and a deep green with Syrup of Violets. A gallon contains 190 grains of sediment, of which 140 are lime-stone, and 50 a calcareous nitre. The salt will not dissolve intirely in 48 times its own weight of distilled water ; but it will turn of a pale green with Syrup of Violets. This water is a more powerful absorbent than any other of this kind, and it will purge well if drank to the quantity of three or four quarts.

Shapmore is a marshy heath, lying between the mountains to the north of *Shap*. The water here seems to be of a sulphureous nature, for it has a strong fetid smell, and a sensible bitterness ; but this soon goes off when it evaporates over the fire. It will curdle with Soap, and let fall a large white sediment, with the Solution of Potashes. A gallon will yield 376 grains of a saline sediment, with a very small proportion of very white earth. It is very white, and has a salt, pungent, bitter taste, growing moist when exposed to the air. This water has been casually found to work by stool and urine, and three pints have proved a very strong purge. It will cure inveterate piles, and is used by the common people to cure rheumattick pains in the joints, by rubbing it warm on the parts affected.

Wisherlake is a village seven miles south-west of *Kendal*, where the mineral Spring has a saltish taste, and in summer smells a little like sulphur, throwing up a whitish scum. With Oil of Tartar it lets fall a pearl-coloured sediment, and with Galls it precipitates one that is purple. A gallon yields 547 grains of sediment, consisting chiefly of a sea-salt and a calcarious earth, with a little mixture of a bitter, purging salt. From experiments made with it, it appears that it is chiefly impregnated with sea-salt, combined with a kind of calcarious nitre, a little iron, and a small quantity of sulphur. It has been found of great use in the stone, gravel, worms, want of appetite, the cachexy, jaundice and dropsy.

WILTSHIRE has a mineral Spring at *Chippenham*, very lately taken notice of, and was found in a garden near the river. At the spring head it has a brisk ferruginous taste, and will turn of a claret colour with Galls. A gallon will yield 39 grains of a sediment of the colour of oker, which has a very brackish taste. It contains a strong sea-salt, and a natron combined with iron. It has cured scorbutick disorders, besides others that are not particularly taken notice of.

West-Ashton is a hamlet in the parish of *Steeple-Ashton*, four miles east of *Trowbridge*, which has a spring that yields plenty of water all the year round. It is clear, and will deposite a small quantity of sediment, after it has been kept several months in bottles. It will curdle with Soap, and lets fall a white grumous sediment with the solution of Pot-ashes. A gallon will yield two drams and two scruples of a whitish sediment, with a saline bitter taste and warmth on the tongue. It is chiefly impregnated with sea-salt, nitre, and a little iron, with a small matter of sulphur. The water is best drank at the fountain

tain head, and three pints is purging and diuretick.

Road is a village eight miles north of *Bath*, where there is a mineral Spring, whose water has a chalybeate and sulphureous taste and smell. A gallon will yield near a dram of a yellow coloured sediment, that has a salt and pungent taste. The water appears to be impregnated with iron, sulphur, and a strong, native alcali or natron. It is a very gentle purge, and is good in scrophulous cases and diseases of the skin; and it will cure scorbutick ulcers.

Holt is six miles east of *Bath*, and is of note for its medicinal spring, first taken notice of in the year 1713. It will let fall a gross, grumous sediment with Oil of Tartar, and when mixed with Spirit of Sal Ammoniac, a white crusty substance adheres to the sides of the glass. It will not lather with Soap, but it will ferment with Oil of Vitriol. With Syrup of Violets it will become greenish, and with Galls change to a green. Logwood turns it to a deep red, Brazil Wood to a scarlet, and Rhubarb to a pale amber colour. A gallon will yield 176 grains of very white sediment, which has a saltish, bitter taste, and will grow moist in a damp air; but the earthy part is nearly equal to the salt. This water principally contains a calcarious nitre, and the operation is more mild, than other springs of this kind, on account of a large quantity of earthy matter contained therein. In small doses it is an alterative and diuretick; but two quarts will purge pretty briskly. It will dilute, cool, absorb and strengthen, and is used both externally and internally. Rags or a sponge dipped therein, will cure scrophulous ulcers, attended with carious bones; but then it must be taken inwardly at the same time. It will also cure inveterate running ulcers

of

of the legs and other parts, and diseases of the skin, attended with great heat and corrosive humours. It is good for sore eyes, the piles, and ulcers of a cancerous nature, used outwardly and drank inwardly. It never fails of procuring an appetite, and will strengthen the relaxation of any part.

YORKSHIRE has several mineral Springs, one of the principal of which is at *Malton*, otherwise called *New Malton*, and it lies in the road from *York* to *Scarborough*. The spring lies at the west end of the town, and is so strongly impregnated with iron, that it is called the *Malton Spaw*. Seven pints contains three drams and a half, of a reddish brown sediment, which has an austere bitterish taste, the salt of which is a calcarious nitre, though different in some sense from others; for it will not ferment with Oil of Vitriol, nor Spirit of Salt; but it will turn greenish with Syrup of Violets. The mud and scum of this water, will dry up and heal old ulcers, scabs and tetter to a wonder. Internally, the water works agreeably by stool and urine, unless the stomach be foul, and then it will vomit the first day or two. The common dose is from three pints to six; but some think smaller doses would be more proper. It is good in the hypocondriack melancholy, in an asthma with spitting of blood, and in internal ulcers and bleedings. It is also recommended in obstructions of the bowels, and in a relaxation, weakness, and languidness of the body, it being a strengthener and deobstruent as well as a purge.

Croft is a village in the *North Riding of Yorkshire*, on the confines of the bishoprick of *Durham*, where there is a spring of fine, clear, sparkling water, with a strong smell of sulphur. A gallon yields 177 grains of a very white sediment, which

which has a strong smell like that of hawthorn flowers. It consists of lime-stone, nitre, and sea-salt ; but the nitre is double or treble to the latter. It is a purging water, if drank from four pints to nine, and is said to have performed many eminent cures, both by drinking and bathing.

Harrogate is two miles north-west of *Knarlesborough*, in the *West Riding* ; and it is supposed to be the strongest sulphureous water in *Great Britain*. A gallon of that commonly drank, for there are three wells, contains two ounces of pure sea-salt, and near two scruples of earth ; therefore the predominating salt must needs be marine. A warm bath made with this water, cures aches, bruises, strains, lameness, weakness of the back, beginning of the dropsy, and paralytick pains and weakness. It also dissolves hard swellings, cures old ulcers and all diseases of the skin ; it has also great power in easing the gout and sciatica. Internally, drank from three to four pints, it purges briskly, and raises the spirits. It powerfully cleanses the stomach and intestines, killing all sorts of worms ; besides which it will cure the cold scurvy, and helps the jaundice of many years standing. It also cures disorders of the spleen, the greensickness, cramp, the head-ach and the King's Evil.

Broughton water proceeds from a spring, in the road from *Skipton* in *Yorkshire*, to *Coln* in *Lancashire*, the village being in the mid-way between those two places. It is of a whitish colour, and colder than common water, as is observable in others of the sulphureous kind. A gallon contains four drams of sediment, the fourth part of which is earth, and the rest sea-salt and nitre. The virtues are much the same as those of *Harrogate* water, but weaker.

Wigglesworth is a village in the *West Riding*, four miles south of *Settle*, where there is a spring remarkable for yielding an alkaline nitrous salt. It is very black, and has a strong smell of sulphur, with a saltish taste, and lathers with Soap; but will not curdle Milk. Three gallons yields seven drams of sediment, of which six scruples and a half are black earth and the rest salt. The country people drink four or five pints of this water as a vomit, and six or seven as a purge; but it seems strange that more should be required for the latter than the former.

Newton-dale is in the *North Riding*, 12 miles west by north of *Whitby*. The water here is cold and very astringent; and it petrifies every thing in its course, producing various and beautiful incrustations and figures. It effectually cures loosenesses and bleedings of every kind, both in men and beast; and it quickly and wonderfully restores weakened joints, that are even beginning to be distorted, by bathing therein.

Knareborough is noted for a dropping Well, so called, and is a market-town in the *West Riding*. The water is very cold, extremely limpid and sweet, and it will let fall a white sediment with Oil of Tartar. It has a petrifying quality, and its particles consist chiefly of spar and some sulphur; a gallon of the water that fell from the petrifying rock, yielded 185 grains of sediment, of which seven scruples and four grains left five scruples and four grains of earth, which would ferment with acids; and there were two scruples of salt, which shot into nitrous crystals. It cures inveterate fluxes of the belly, bloody fluxes and the diabetes, as well as all preternatural discharges of blood, and it cures colliquative sweats, as well as ulcers of the bowels, and hectick fevers. Three half pints are a dose.

Scarborough

Scarborough Water is the most noted in all *Yorkshire*, and it was discovered about 160 years ago. It has been much used of late years, not only at the fountain head, but at distant places. The taste is bitterish and ferruginous, and it curdles with Soap, and yields a large white grumous sediment with Oil of Tartar. A gallon yields about 284 grains of a reddish white colour, with a bitter, saltish and roughish taste. It destroys the sourness of acids, ferments strongly therewith, and turns of a light green with Syrup of Violets. The proportion of earth to the saline parts, is as 66 to 150. The water has been found good in hectic fevers, the rheumatism, scurvy, preternatural thirst, recent and partial inflammations, and diseases of the skin. It is also good in disorders of the stomach from intemperance, as well as in hypocondriack and hysterick disorders; in asthmas, in habitual costiveness, the heart-burn, and in all cases where purging is indicated. Some recommend it against all preternatural evacuations, as gleans, the fluor albus and bloody urine, to which may be added the green sickness.



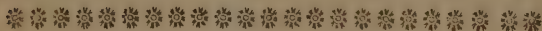


T H E

NATURAL HISTORY

O F

WATERS, EARTHS, FOSSILS, and
MINERALS.



C H A P. I.

Of Medicated Mineral Waters.



AMONG Medicated Mineral Waters some are cold, and others hot; the former are called by physicians ACIDULÆ, that is, a little partaking of acid, because some of them have a sub-acid or vinous taste, especially when they are taken immediately from the spring. The hot springs are supposed by some to be owing to subterranean fires, because near those places where there are volcanoes they are most frequent; but others think they arise from the fermentation of the different particles of which they partake as they pass through different strata of the earth; as for instance,

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Iron and Sulphur. But be this as it will, their virtues are not owing merely to the heat or cold, but to the principles of which they are composed; for which reason it will not be worth while to treat of them as such, but to take notice of their contents, to which their properties are owing.

Of the MINERAL WATER containing earthy Particles.

There are mineral Waters which have imbibed earthy particles that have the properties of Soap, particularly the Soapy Water of *Plombiers* in *France*, which, at the spring head is warm, and tastes a little fat or soapy, with a small degree of roughness. This is supposed to run through a strata of Fuller's earth; it is prescribed in disorders of the stomach, proceeding from acidities, as well as in spitting of blood, excessive bleedings, a consumption of the lungs, and many other disorders for which they are either drank or used as a bath. A large quantity is to be drank in a morning upon an empty stomach, and some make use of it for common drink.

Of WATERS impregnated with Salts.

Waters that have imbibed Rock Salt are not very uncommon, but they are not as some imagine of the same nature as those in which common Salt is dissolved; because this latter is not a simple substance, but contains a mixture of Rock Salt and fixed Alcalious Salt, imbibed in the bowels of the Earth; and that which is made with Sea Water partakes of a Volatile Urinous Salt, which is the produce of the putrefaction of fish, sea plants, and other marine substances, together with Bitumen and various Minerals.

It is but lately that the Sea Water has been of any internal use in medicine, or at least its properties have lain dormant for a great number of years, except for diseases of the skin, for which it has been ordered as a bath; it has been recommended in all disorders of that kind, from the itch to the leprosy, as well as pains in the limbs; and some have thought, and still think,
that

that it is a specific against the bite of a mad Dog. But it is now prescribed inwardly in all obstruction of the glands, and the diseases arising therefrom, for which it is both drank and used as a bath ; nor is it of any great moment in what part of the body these obstructed glands are seated ; that is, whether in the intestines, mesentery, neck, joints, eyes, or nostrils. It is also good against obstructions of the kidneys, when there is no inflammation, or the stone is not too large to pass. And likewise against recent obstructions of the liver, and consequently the yellow jaundice, when given with medicines proper for that disease. A person of twelve years of age may drink half a pint every morning, and an adult a pint.

The Waters of mineral springs impregnated with Sal Gem, when given inwardly, open the body and promote urine ; besides which they are drying, binding, and discutient whence they are good in cachexies, and the dropsy.

Those Waters are said to be nitrous, which abound with a Salt like the Natrum of the ancients, which some have mistaken for Saltpetre ; whereas it is a kind of Alcalious Salt. Those springs that abound with it, are good for dissolving thick clammy humours, for opening obstructions of the bowels, as well as in a decayed appetite. When used as a bath, they help to resolve swellings and obstructions of the nerves.

Of Sulphureous WATERS.

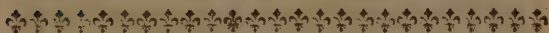
There are many mineral Waters that partake of Sulphur, which may be easily known by the smell, as also by the sediment that is left after it has been evaporated over the fire. These are commended in disorders of the breast, and foulnesses of the skin, whether drank, or used in a bath ; as also in trembling of the limbs, contractions of the tendons, the rickets, and some kinds of palsies.

Our *Bath* Waters are thought chiefly to partake of Sulphur, mixed with an exalted Vitriolic Steel. They are good in all weaknesses and decays of the constitution, as well as for the stomach, when it has

been worn out with frequent debauches. They likewise dissolve and carry off viscid and saline particles in the blood and humours, and sweeten the fluids in general. Hence they are good in dropsies and consumptions before they are too far gone ; as also in catarrhs, cachexies, jaundice, scurvy, scorbutic rheumatisms, asthmas, and all diseases of the skin, as well as old pains and aches ; nor are they less effectual in many women's disorders.

Of WATERS impregnated with Metals.

These in general partake of Iron or Steel, though there may be possibly some of other kinds which have not been taken notice of by naturalists. There are many of these in *Hungary, Germany, France* and other parts of the world, but the *Pyrmont* and *Spaw* Waters are the most famous we have from abroad ; and in *England* we have the *Tunbridge, Scarborough, Hampstead, and Islington*. These in general dissolve gross humours, sweeten those that are salt and acid, and open obstructions. They are accounted good in all diseases of the head, whether they arise from the consent with the stomach, or not ; they are also good in many diseases of the breast, particularly shortness of breath, coughs, and spitting of blood. In short, they are efficacious against all those distempers wherein Iron or Steel is of any use ; and they must be much better, because the particles of the metal are become so volatile that they do not change the colour of the water ; but then they are apt to fly off after they have been exposed to the air for a few days. Besides as it is necessary to drink a pretty large quantity of these waters, the solution of gross thick humours is much better performed hereby, than by administering the metal in any other form.



C H A P. II.

Of E A R T H S *and* C L A Y S.

THAT sort of Earth which we call SOIL, proceeds from the putrefaction of animal and vegetable substances, and will burn in the fire and swim in the water. *Linneæus* has nine sorts of these, whereof one does not properly belong to this class; the others are, the Marshy Soil interwoven with roots, and this is the same that we call Turf, which in many parts of *England* is used for such. The Vegetable Watry Soil is nothing else but Mud, and is to be met with every where in and about standing waters. The Spungy Soil of heaths will ferment with some sort of fluids, particularly acids. The Vegetable Soil of the *Alps* is to be met with every where among those mountains, and it is a little reddish, or rather of a blackish brown. The Vegetable Common Black Soil is met with in various places, particularly in meadows, fields, and pastures. The Vegetable Reddish Soil partaking of Oker, is particularly found in *West Gothland*. The Animal Soil of brute beasts, may be met with in places where several of those animals have been laid in heaps, and have putrified and turned to Dust; that of human bodies may be seen in every church yard.

Of C L A Y S.

A CLAY is a heavy, thick, fat, tenacious, smooth Earth, which when held in the mouth becomes like soap or suet; it is either soft or hard, in proportion to the quantity of Water that is mixed with it, for it readily dissolves in that fluid. When it is soft it may easily be shaped into any form; but, when it is baked in the fire it turns into a stony substance. There are a prodigious number of different sort of Clays, and of different colours.

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6 The NATURAL HISTORY of

That Clay that is perfectly pure and white is of a very fine texture, and when cut leaves a polished shining substance; when examined by a microscope it appears to be of a close even regular texture, unless mixed with particles of a different kind. It will ferment pretty briskly with Aqua Fortis, as will most other kinds, for *Linnaeus* makes it a characteristick of Clay. Whether we have any of this sort in *England* or not, is uncertain.

The CIMOLIAN EARTH of the shops is a sort of a Fullers-earth, and is of a dull white colour, though the surface is tolerably smooth. When burnt in the fire it becomes very white and hard, and in a violent fire will turn to a dirty sort of Glass. It is to be met with in several parts of *England*, particularly at *Wednesbury* in *Staffordshire*, where they use it for making tobacco pipes, as they do another sort, which is hard, heavy, and of a greyish white that is said to be the best of all Tobacco-pipe Clays. Besides these, there are the White Tough Clay, the Smooth Greyish White Clay, the Heavy Grey Clay, the Soft Grey Alkaline Clay, a Hard Grey Alkaline Clay, a Soft Ash-coloured Heavy Clay, and several other kinds, whose differences are not so considerable as to be particularly insisted upon. They are used for making tobacco-pipes, Dutch tiles, and several sorts of earthen ware.

The EARTH of MALTA, so called from the Island, from whence it is brought, is a sort of a Clay of a whitish ash colour, and is imported in small cakes, marked with various characters. Some have supposed it to have been endowed with wonderful virtues by *St. Paul*, when he was shipwrecked in that island; some have vessels made of it, and suppose the wine drank out of it to be endowed with extraordinary qualities.

There are four sorts of YELLOW CLAY, all which will ferment with Aqua Fortis; one of these is entirely yellow, another yellow with blue spots, the third is a sandy Clay, and consequently brittle as well as the fourth, which is of a brownish yellow. They are all of use for making some sorts of earthen ware.

The Hard Brown Spotted CLAY, is in some degree transparent, and is of a fine shining pale brown colour,

colour, variegated and spotted with deep black. It does not stain the hands when touched, and yet it adheres firmly to the tongue, having a sort of an astringent taste, but without grittiness. This is what is usually called *Lemnian Earth*, or *The True Sealed Earth*, and is brought over in small cakes, weighing above four drams each, and marked with several characters. The island on which it is dug was formerly called *Lemnos*, but now *Stalimene*. The virtues of this Earth, or Clay, were formerly greatly celebrated, and it was given as an antidote against poisons. It was supposed to be of an alkaline substance, but this is found to be a mistake, for it will not ferment or effervesce with *Aqua Fortis*, nor indeed several others, notwithstanding what *Linnæus* has said to the contrary. When analysed it is found to contain a small quantity of an urinous volatile Salt, a small matter of bituminous oil, and a little Salt like common Salt. It may be easily dissolved in Water, and has been given by some in the bloody flux, in ulcers of the bowels, and malignant fevers; but it is now not used with us.

There are three ENGLISH CLAYS of the brown sort, as the Brown Heavy Tough Clay, with which they floor barns in some places, and in others make earthen vessels. The Dusky Bluish Brown Tough Clay, which when burnt in the fire turns to a red colour, and in a violent fire to a deep green grass; however, it is most useful for making of tiles. The Hard Pale Brown Clay is generally full of shining particles, and is of a rough kind; but being mixed with tougher Clay in *Staffordshire* it serves to make strong vessels of several kinds.

The Blueish Brittle Soft CLAY, has somewhat of the nature of Marl, and when dry it appears to be full of shining particles. It burns to a darker colour, and is used in several parts of *England* for making a very strong sort of earthen ware. The Tough Bluish Clay has an even smooth shining surface, and when burnt in the fire it becomes as hard as stone, and of a fine red colour. It is to be met with in *Northamptonshire*, but at present is made no use of. The Hard Tough Pale Blue Clay is extremely heavy and of a close

even texture, being burnt it turns to a pale yellow; but it will not well endure the fire. It is used to make gally pots, and the like. The Light Soft Blue Clay is of a loose texture, and burns to a pale reddish brown; there are but small quantities found of it at a time, and therefore it cannot be supposed to be much in use in making any sort of vessels. The Hard Tough Whitish Blue Clay is supposed to be that with which they make *China* ware here in *England* when mixed with other things; but however this is not certain.

The Green Heavy Turf CLAY, is a fine smooth compact Earth of a dull dusky green, and very heavy. It has hitherto been put to no use. The Pale Smooth Green Hard Clay is of a smooth even regular texture, very heavy, of a shining surface, and almost as hard as a Stone. When a thin piece of it is held up to the light it is almost transparent; but in the fire it loses its green colour and turns to a pale grey. It has been brought from *Saxony* in *Germany*.

VERDITER is a sort of a bluish green hard Clay, and is usually dug out of the Earth in lumps of different sizes, that is, from half a pound to six pounds and upwards. It is of a fine even glossy surface, and very smooth to the touch; it does not colour the hand; but when it is drawn along a rough surface it leaves a dusky green line. When burnt it is of a dusky brown colour, being entirely divested of its green or blue. It has been brought from several parts; but that from *Italy* is the best, and is much used by painters.

The ENGLISH VERDITER is got out of *Mendipp Hills* in *Somersetshire*, and is a hard, heavy, firm earth, of a deep dusky green colour; when burnt it becomes as hard as a stone, and of a very pale whitish brown colour. It seems to be very proper for some sort of paintings, though it is made no use of at present. There is another Greyish Green Brittle Clay, that is met with in *Mendipp Hills*, which bursts and crackles in the fire, though the change of the colour is very small; but it acquires a considerable hardness.

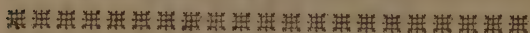
The Soft Pale Red CLAY, is very clammy while soft, but when dry it is compact and hard, and of a very beautiful pale red, variegated with grey, at least sometimes.

sometimes. In the fire it grows as hard as stone, but the colour is much the same. It is brought to *London* from the *Isle of Wight*, and is said to be of some use to the workers in mahogany wood. The Pale Brownish Red Smooth Clay has somewhat of a brownish cast, and is commonly veined with Pale Blueish Grey Clay; it is considerably heavy, and of a very close even texture. It crackles at first in the fire, but becomes pretty hard. In *Staffordshire* it is part of the composition of their finest earthen ware. The Dusky Brown Reddish Blue Clay is found in several parts of *England*, particularly in *Staffordshire*, where it is a principal ingredient in their fine earthen ware.

The Light Brittle Black CLAY, is more dry than the generality of this sort, and not quite so tough; but it is seldom met with except in small quantities at a time. In the fire it emits a pale blue flame, with a sulphureous smell, and burns to a very deep red. It is common in many parts of *England*. The Tough Heavy Black Clay, while in the bed, is of a shining jet black, extremely heavy, and pretty moist, with a fine glossy smooth surface when cut with a spade; when dry, it becomes extremely heavy and compact, and will not dissolve easily in water. In the fire it becomes as hard as a stone, and of a pale red colour; it was formerly unknown in *England*, but has been lately met with in *Staffordshire* and elsewhere. The Heavy Brittle Black Clay is very fine, heavy, and of a smooth compact texture. When burnt, it becomes perfectly white, for which reason in *Northamptonshire* it is used for making tobacco pipes.

There are Sealed EARTHS in *Germany*, so called, because they are marked with particular seals; the principal of which are at *Gran* in *Hungary*, and *Goldberg* in *Silesia*. That of *Gran* is called the Marrow of Gold; it is of a yellow colour and fat, seeming to be of a soapy substance, and melting in the mouth. It is got out of the gold mines near *Gran*, and is under the care of the magistrates, who have it made into round balls, and marked with the city seal. They suppose it to be impregnated with a golden Sulphur. The *Goldberg* Sealed Earth has the name of the Marrow of

Silver, and is of a whitish grey colour. It is supposed to be derived from silver, from whence it has its name. It is said to be good for all venomous or poisonous distempers when given to a drachm, but it is not brought into practice in *England*.



C H A P. III.

Of M A R L S.

MARL is an earthy, brittle, light substance, between Clay and Chalk, for it is not so soft and fat as Clay, nor so hard as Chalk, nor will it very easily dissolve in water.

CIMOLIAN EARTH, is heavy, but loose and apt to crumble, for which reason being thrown on the surface of the earth it soon moulders away. *Tournesfort*, who saw it on the island of *Argentiere*, affirms it is a sort of a heavy, white Chalk, without any taste, abounding with a small grit that sets ones teeth an edge. It has not the least effervescence when put in water; for it only melts away, and turns to a sort of fizy liquor of a greyish colour. It is not at all affected with the oil of tartar, but spirit of salt poured on it causes it to ferment. It is pretty fat and soapy, and is used among the inhabitants for washing of linen. It was formerly said to have several medicinal virtues, but it is quite out of use at present.

SAMIAN EARTH, is a very fine pure earth, of a close equal texture, and yet remarkably light; when dry it is of a fine bright white, with a smooth polished surface; it is very soft to the touch, and adheres firmly to the tongue; when burnt in the fire it becomes of a snowy white, and is found in the *Isle of Samos*; but at present it is not used in medicine.

The SAMIAN ASTER, is by some called *Samian Earth*, but it differs greatly from the former; it being of a loose texture, and will not cut into regular pieces. It is of a pale brownish white, and seems rough, dry, and dusty to the touch, but adheres firmly
to

to the tongue. It turns to a pale ash colour in the fire, and is found between the clefts of stone in the *Island of Samos*.

CHIAN EARTH is a dense compact substance, but of a soft texture, and easily broken in pieces. When dry it has an irregular surface of a pale greyish white, and seems to consist of numerous flakes. It is very fine and soft to the touch, adheres firmly to the tongue, and melts freely in the mouth. Thrown into the water it causes it to bubble with a hissing noise, and melts into a substance like cream; in the fire it becomes perfectly white, and is found in the island of *Chio*, but it is of no use in medicine.

CELENEUSIAN EARTH, by some called Mineral Agarick, is found in the perpendicular clefts of the strata of stone, in irregular masses of a fine pure white colour. It is spongy, brittle, whitenes the fingers, and adheres firmly to the tongue. When thrown into water it sends up a great number of bubbles with a hissing noise, and turns it white. It comes to a snowy whiteness in the fire, and is found in stone quarries almost all the world over.

The White Spongy Dense MARL, is not so white as the former, but is of a more dense texture. It is frequently found in the cavities of stones, and if alone it is generally near the surface of the earth. When it is dry it becomes of an uneven compact texture, moderately heavy, and of a dull dead white. It bubbles in the water like the former, with a hissing noise, and is found in many parts of *England*.

Hard Spongy Alcaline White MARL, called by some Native Lime, is a hard, dry, coarseish earth found in the clefts of stone, and sometimes lying loose upon, or immediately under them. It is of a dull whitish colour, with a small mixture of greyish brown, and is of a more firm texture than the former earths. It bubbles and hisses like the former, and will cement like Lime. It is found in some parts of *England*.

MELIAN EARTH, is found in the island formerly called *Melos* now *Milo* in the *Archipelago*, is not unlike the *Cimolian*, and is made use of there for washing of
linen,

linen, though *Tournefort* imagines that island affords whiter, and more proper for the purpose, if the inhabitants would be at the pains to dig for it.

CRETAN EARTH, or CHALK, was so called by the ancients, because it was found in the island of *Crete*, now *Candia*; but it is now to be met with in most parts of the world, and particularly in *England*, in very great plenty, where there are many large hills of it consisting of nothing else. It is an Alkaly, and therefore is given in acidities of the stomach, and the heartburn, when properly prepared; though some take it as it is for that purpose without any preparation. It is likewise good in coughs that proceed from acrid phlegm. It is commonly given from ten grains to a drachm, but there is no danger in taking larger doses.

Blueish Chalk MARL when dry, after it is taken out of the earth, is of a hard texture, of a blueish colour, generally veined or spotted with red. It is very soft and smooth to the touch, and will not adhere to the tongue, at least very little. Burnt in the fire it turns to a palish brown, streaked with dark red. It is found in some parts of *England*, and in some places serves to manure land.

Blueish Brown Brittle MARL, is of a loose texture, and very light. It is soft to the touch, and adheres a little to the tongue, melting freely in the mouth, it being a pure fine earth. It is somewhat alkalious, and when burnt turns to a dirty reddish brown colour. It has sometimes a great many sea shells found in it, and is a good manure for land.

Stony Blueish MARL, is the hardest of this class, and is of a rough compact texture, with an unequal surface. It bubbles in water, but will not ferment with aqua fortis, and in the fire turns to a dull dusky red. This and the former are found in several parts of *England*.

Yellow Brittle Sandy MARL, breaks into small pieces when dug out of the earth, and when dry is of a brighter yellow than before it was dug up, which is the property of all colours, for a little water will turn them darker. It is spangled all over with small, flat, glittering particles, and is rough and dusky

to the touch. When burnt in the fire it turns to a fine deep red colour, and it is a good manure for heavy stiff Clay lands.

Pale Red Brittle MARL, is always found in the cavities of Stone, or in perpendicular clefts of the Earth, and has a fine, compact, close texture, with an even, smooth, soft surface. It is common in *Germany, Italy, and France.*

Red Brittle Heavy MARL, is very common in *England*, and is a good manure for poor hungry land. It is of a crumbly texture, and commonly very dry; it becomes of a deeper red in the fire, and much harder.

Deep Dusky Red Sandy MARL, is frequently found variegated with whitish, greyish, or bluish Earths, and is of a loose crumbly texture. It melts very readily in the mouth, but leaves a great deal of harsh, sandy matter between the teeth; when burnt it becomes of a deeper red, but not much more hard, and is found in our *North American Plantations.*

Stony Red MARL, is greatly valued by the farmers for making a good manure; for though it is almost as hard as a stone when laid upon the surface of the earth, it will crumble to bits, which perhaps is owing to the rain, for it will break to pieces in about ten hours time in water. Fire makes little alteration in it, and it is found in several parts of *England.*

RUDDLE, by some called Red Oker, and by others Marking Stone, is a sort of Marl of a thin texture, and very brittle. It is of a red colour, and has a smooth soft surface. When burnt it becomes pretty hard, but does not change the colour. It is used in the country for marking of sheep, and by the painters for colouring of pales, window shutters, and the like. The best is said to be brought from *Derbyshire.*

Red Heavy Hard MARL, is firmer and drier than the former, it being of a regular close texture, and composed of several thin plates lying close upon each other. In the fire it burns to a darker red, and grows much harder. It is used by the furriers to mark with.

Brown

Brown Brittle MARL, is of a loose texture, and easily crumbles, but makes a very good manure. It is sometimes variegated with grey, and sometimes with black, and is a little dry and dusky to the touch. When burnt it becomes of a pale red, and somewhat more hard. It is used to manure grass land in *Sussex*.

Fullers EARTH, is well known almost to every one, being commonly used for getting greasy spots out of cloaths. It is soft, and of a greyish colour; but sometimes paler, and sometimes of so deep a colour as to be almost black; though it has always a greenish cast. It melts freely in the mouth, and for its softness and smoothness is sometimes called Soapy Earth.

Green Fullers EARTH, is the most dense and compact of all kinds of Marl, and is of an even smooth texture, being extremely soft and oily to the touch. It melts freely in the mouth, and in the fire turns to a very pale brown. It is found in *Germany* where it is used as common Fuller's Earth.

Green Sandy Brittle MARL, though very heavy is of a loose texture, and easily crumbles in pieces. It is found in many parts of *England*, and is used in *Sussex* to manure clay lands.

Black Brittle MARL, is of a loose texture, and easily crumbles, though it is very heavy; and though it be of a brownish black it does not stain the hands. It is found in *Mendip Hills* in *Somersetshire* above twenty feet deep in the earth.



C H A P. IV.

Of O K E R S.

LIGHT Brittle Pale Yellow OKER, is between the colour of Brimstone and what is called a cream colour, and is of a loose crumbly texture, it being composed of very thin fine plates. It is extremely light, and separates into flakes in the fire of a dull reddish brown colour. It is found in *Pensylvania* and *Virginia*, and with water makes a straw colour, but
with

with oil a pleasant yellow; however, it is not at present used by the painters.

Hard Heavy Pale Yellow OKER, is well known to the painters, and is of a close, compact, firm texture, with a smooth even surface; when burnt in the fire it turns of a dull pale red, and becomes considerably hard. It is found in several parts of *Europe*, and particularly in *Somersetshire*.

Light Crumbly Yellow OKER, is commonly seen at the mouths of the springs of the Spaw kind, and at present is made very little use of; nor can it be expected in any large quantities. In the fire it turns to a pretty good red.

Light Brittle Gold Coloured OKER, is found in small lumps in the earth, and is very light, being a crumbly texture, and stains of the hands of a true gold colour. It turns to a bright red in the fire, and becomes a little more hard. It is common among gravel in several parts of the kingdom, particularly on *Mendip Hills*, where it lies in the clefts of the strata. It is also in a gravel pit on the right hand of *Oxford Road*, about a mile from *London*. When burnt it turns to a red, and might probably be of use to the painters.

Light Plated Saffron Coloured OKER, is sometimes found making a stratum, and sometimes in the perpendicular clefts of other strata, and is of a soft crumbly texture, with a rough and even surface, but colours the hands with a very beautiful yellow. It burns to a dusky red, and is common in *Northamptonshire* and *Staffordshire*. If it had a body it would make a fine colour for the painters.

Common Yellow OKER, is a dense heavy earth, of a dull yellow colour, staining the hands with a dusky yellow. It ferments pretty much with aqua fortis, and burns to a pretty good red. It is greatly used for house painting.

Hard Heavy Clayey Yellow OKER, is very compact, and when dry is of a very fine bright yellow, with a smooth glossy surface. It burns to a red, but crackles in the fire. It is found in *Buckinghamshire* and *Yorkshire*, and is sometimes used by the painters.

Stony

Stony Hard Heavy Yellow OKER, is in great plenty about *Oxford*, but it is so hard that it is not to be cut with a spade, and therefore they are forced to use pick axes. It crackles a little in the fire, and turns to a fine red. It is used by the painters.

Dull Dusky Yellow Clayey OKER, is found in several parts of *England*, and is dense, compact, and heavy. It is but a dusky unpleasant colour, though it burns to a very fine pale red, and becomes almost as hard as a stone. It is sometimes to be met with in the colour shops.

Light Clayey OKER of a brownish yellow, is sometimes found among other strata, and in their perpendicular clefts. The surface is smooth and glossy, and the texture very fine; it burns to a dead dusky brownish red. It is found in several parts of *England*, and being of a good body is used by the painters.

NAPLES YELLOW, is of a bright beautiful colour, between that of gold and saffron; but it is very loose, spongy, brittle, and porous, and ferments pretty briskly with aqua fortis. When burnt it turns to a deeper yellow, and is found in *Italy*, particularly about *Naples*. It is generally esteemed as a pretty good colour.

Brittle Heavy Red OKER, is common in several parts of *England*, and is of great use among the painters. It crackles a little in the fire, where it becomes more hard, and of a paler colour. It is used by painters for priming the coarser sort of works.

Brittle Purple OKER, is common in *Spain*, and is a very fine colour, and though it is of a loose texture it weighs very heavy. It is of a fine deep purple before it is dug up, and when dry it turns red. It is a strong Alkaly, and therefore ferments greatly with aqua fortis; in the fire it turns to a paler colour.

INDIAN RED, is a very fine purple earth, of a firm, compact, and hard texture, it being heavy, and almost as hard as a stone. Before it is dug up it is of a blood colour, but when dry of a fine glowing red, and is full of bright glittering particles of a whitish colour. In the fire it burns to a greater hardness without much changing the colour. It is found in the *Island of Ormus*
in

in the *Gulph of Persia*, from whence it is by some called the *Persian Earth*.

Bright Red Brittle OKER is found in *Bengal* in the *East Indies*, and though used in *France* is not much known in *England*. It is of a fine, bright, florid, red colour, and pretty heavy, though it crumbles between the fingers, and stains the hands. It ferments with aqua fortis, but undergoes little alteration in the fire.

VENETIAN BOLE, is a sort of an Oker, and is well known among painters, it being of a fine bright pale red, being pretty nearly of the colour of Red Lead. It grows harder when burnt, but the colour is worse. It is brought hither from *Venice*.

Pale Red OKER, is light, brittle, and of an alkalious nature, for it ferments very briskly with aqua fortis. It somewhat resembles the *Venetian Oker*, only it is brighter, and of a little paler colour. It is found in *Florida*, and is very probably in other parts of *America*, though it is not much known in *England*.

Pale Red Clay OKER, is found in *North America*, and though pretty heavy, is of a loose, brittle texture. It is nearly of a flesh colour, and burns to a good red in the fire. It is at present made no use of.

EARTH of *Sinope*, is so called from a town of that name in *Natolia*, and is a sort of a Bole, sometimes of a deeper, and sometimes of a paler colour. *Tournefort* thinks it is a sort of natural saffron of iron. The best is of a liver colour without any mixture, though some affirm it is of a fine bright purple; but the above author, who has viewed it upon the spot, affirms the contrary. It has been sometimes used in medicine, on account of its being of a drying nature, and particularly in fluxes of the belly.

Red CHALK, is of a very dense compact substance, and is of a dull red colour. Some use it in the manner of crayons, or rather like black lead pencils. It is very well known to painters, and therefore needs no farther description. It is found in several parts of *Europe*, and particularly in *Flanders*.

Red Stony OKER, is the hardest and driest of any of this kind, and is found in regular strata in the earth

earth, but is so hard that it cannot be got up without pickaxes. It is of a fine purplish red colour, and is very heavy, being mixed with fragments of Lead Ore, of a bright bluish colour; as also a small quantity of pure native Cinnabar. It burns to a fine red, and becomes more hard in the fire. The painters call it *Indian Stone Red*, it being brought from *China*; but it is very scarce.

Brown UMBER, is a sort of an Oker, and is greatly used by painters. It is found loose in small lumps among gravel, and sometimes in the perpendicular clefts of other strata. It is very light, though of a close compact texture, and it burns to a deep brown in the fire. It is generally brought from abroad, there being very little of it in *England*, though it is thought to be in *Mendip Hills* in *Somersetshire*.

COLOGN EARTH, commonly called Cullens Earth, is well known among the painters, and is of a dusky brown colour, with a close, compact, fine texture, but extremely light. It is not at all gritty, and has the taste of oak bark. Being thrown in the water it swims on the surface till it is quite wet, and soon breaks into a very fine powder. It is easily set on fire, and never goes out till it is reduced to pale yellow ashes; from whence it appears to be of a vegetable nature, owing its origin to wood long buried in the earth. It is brought to us from the city of *Cologne*, from whence it has its name.

The ARMENIAN STONE, is very opaque, and mixed with green, blue, and black spots, somewhat in the manner of Lapis Lazuli. It is of an even, regular texture, and the general colour is a beautiful blue. Some think it differs in nothing from Lapis Lazuli but in hardness, and is like that very scarce. It was formerly used in medicine as a purge and vomit, and the dose was from six grains to a scruple; but it is now out of use, except among the painters, for when it is prepared, it yields a charming blue colour, with a greenish cast. It is placed among the Okers on account of its brittleness.

Green OKER, or TINCAL, is of a dense, compact substance, though of a coarse irregular texture, the
fur-

surface being rough and uneven, and the colour of a pale green. It is found in many parts of *Germany* in and near the copper mines, and it partakes very evidently of copper. By burning it turns to a hard dusky brown Oker, and therefore is only used in its natural state, it being reckoned a very good paint.

Heavy Brittle Black OKER, is found in masses of different sizes, in the perpendicular clefts of stone. It is of a fine deep black, and of a compact, even, close texture, though it breaks very readily into small pieces between the fingers, and slightly stains the hands. It is common about *Mount Sorrel* in *Leicestershire*, and though it seems likely to make a good black paint, it has not been yet put to that use.

Black CHALK, is found in broad flat pieces from two to ten feet long in the earth, and from four to twenty inches in breadth. It is moist and flaky when just taken out of the ground, but soon becomes pretty hard, and very light. It will cleave very easily one way, and seems to be the offspring of wood buried in the earth; for it will burn, but not so long as *Cologne* Earth. It is much used in painting, and is to be met with in *Spain*, *Italy*, and *Germany*.

CHAPTER V.

OF BOLES.

A BOLE is a heavy fat earth that readily adheres to the tongue, and colours the fingers. It is of various kinds.

ARMENIAN BOLE, or BOLE ARMENICK, is sometimes white and moderately heavy, being of a close compact texture, and having a very smooth surface. It is very scarce, and therefore being quite unknown to the shops it need not be insisted upon.

White Brittle BOLE, is moderately heavy, with a smooth surface, though it will crumble between the fingers. It will ferment with aqua fortis, and in the fire

fire may be burnt to a sort of Lime. It is brought from *Germany*.

NOCERIAN EARTH, is very heavy, and of a greyish white, but not so brittle as some of this kind. It has no taste, nor does it ferment with aqua fortis. It is met with in *Italy*, and some think it good for the bite of mad dogs, and in malignant fevers.

ERETRIAN EARTH, is a fine kind of Bole of a greyish white colour, and pretty heavy, with a smooth surface, though it crumbles very easily between the fingers. It ferments very briskly with aqua fortis, and in the fire it turns perfectly white and as hard as a stone. When a little wetted and drawn over a copper-plate, it will leave a line behind it, which in a short time turns blueish. It is dug up in *Negropont*, near the ancient *Eretria*, from whence it has its name.

Whitish ALKALINE BOLE, is hard and of a close compact texture, and like other Boles melts gradually in the mouth. It ferments but slightly with aqua fortis, but in the fire turns to a pure white. It is found in the *East Indies*.

The yellow ARMENIAN BOLE, is of a saffron colour, and of an earthy, heavy, fat brittle substance, with an astringent taste, is of a close compact texture, with an extremely smooth surface and very hard: but it melts on the tongue though very slowly. It ferments briskly with aqua fortis, and in the fire becomes more hard, and of a deeper colour.

BOLE of *Blois*, is of a pale yellow colour, and of a compact texture, but very light, and readily crumbles between the fingers. It ferments violently with aqua fortis, and becomes almost as hard as a stone in the fire, turning to a much darker colour.

BOLE of *Tokay*, is of a yellow colour and brittle, but very fine, and considerably heavier than the former. It melts easily in the mouth, and ferments violently with aqua fortis; in the fire it becomes considerably hard, but does not change the colour, and the name shews where it is found.

SILESIAN SEALED EARTH, is a sort of Bole which is pretty heavy, and of a compact texture, with a smooth surface. It turns to a kind of chocolate colour

lour in the fire, and becomes considerably hard, but is a stranger to our shops.

LIVONIAN EARTH, is a very fine Bole and very brittle; it is of a dull dusky yellow colour with a reddish cast, and its surface is smooth and glossy. It becomes of a harder texture and a darker colour in the fire, and is usually sealed with the figure of a church, an escutcheon, and two cross keys. It is not only found in *Livonia*, but in *Spain* and *Portugal*, wherewith they make a sort of earthen ware.

BOHEMIAN BOLE, is of a deeper yellow than that of *Tokay*, it having a small mixture of red. The surface is very smooth and shining, and melts readily in the mouth. In *Bohemia* it is thought to be an excellent medicine in malignant fevers, and fluxes.

Red BOLE ARMENICK, is the hardest of all Boles, and is of a reddish yellow colour, not unlike that of saffron. It melts readily in the mouth, and has an astringent taste. That is the best that will most readily beat to powder with a pestle, or dissolve in water, without the least sandy sediment. Its virtues have been greatly cried up in various disorders; but it is now seldom met with in the shops.

FRENCH BOLE, is of an earthy substance, and of a pale yellowish red colour; it is heavy, brittle, and of an astringent taste. It ferments very slightly with aqua fortis, and in the fire becomes of a somewhat redder colour. It is often mixed with sand or small stones, and therefore, it should be mixed with water before it is used, and poured off, after the grosser parts are sunk to the bottom. It is reckoned a good astringent, and is now used in the room of all other Boles, but seldom alone.

The Sealed EARTH of *Striga*, is of a deep dull red, and has a tolerable smooth surface. It will crumble between the fingers, and melts readily in the mouth. It ferments a little with aqua fortis, and becomes harder in the fire, without any change of colour.

Red Sealed EARTH of *Livonia*, is considerably heavy, though of a loose texture, and of a paler colour than the red *Silesian* Bole. It dissolves readily in water,

water, and has a strong astringent taste. The fire makes little or no alteration in it; some pretend it is good in loosenesses.

TUSCAN SCALED EARTH, is a heavy pale red Bole, with a smooth surface, and easily breaks between the fingers. It grows hard in the fire, and the colour becomes somewhat more dark. It is dug up near *Florence*, and is said to be good in loosenesses and excessive bleedings.

PORTUGAL EARTH, is a brittle, heavy, fine red Bole of a close texture, with a smooth shining surface. It becomes a little harder in the fire without change of colour, and is very common in the northern parts of *Portugal*.

TURKEY SEALED EARTH, is of a greyish red colour, and of a looser texture than some other Boles. The surface is soft and smooth, and it breaks easily between the fingers; in the fire it becomes considerably hard, and of a dusky yellow colour. It said to be good in the plague, and to promote sweat. The hard pale red Bole is moderately heavy, and remarkably hard. It is of a beautiful pale red colour, or rather of a flesh colour, with a very smooth glossy surface. In the fire it becomes as hard as a stone, and the colour acquires somewhat of a blue. This is found in *North America* among our plantations.

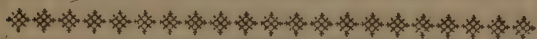
Pale Brown Hard BOLE, is very pure, of a compact texture, and moderately heavy. It consists of thin plates laid closely upon each other, and has a smooth shining surface. It cracks and bursts in the fire, flying off in small flakes at first; but afterwards becomes considerably hard, and of a pale red colour. It is met with in *Germany*, as well as in *America*, and in some parts of *England*.

Pale Brown Heavy Dense BOLE, is very compact, and speckled with white and yellow. The surface is a little rough, but it may be polished by rubbing. It burns to a dusky red, but does not acquire a much greater hardness; and it is found in many parts of *Germany*.

Light Brittle Round BOLE, is of a looser texture than others of this kind, and is less weighty. It has a smooth

smooth equal surface, but readily crumbles between the fingers. It easily dissolves in water, and is a little astringent to the taste. It becomes considerably hard in the fire, and turns to a dark dusky red colour. It is found in several parts of *England*.

Greenish BOLE, is very fine and beautiful, and considerably heavy. It is compact, and of a pale dusky greenish colour, with a smooth glossy surface. It has a brackish disagreeable taste, without any remarkable astringency. It becomes considerably hard in the fire, and turns to a dusky brownish red colour. It is found in the West of *England*.



C H A P. VI.

Of T R I P O L I E S.

SILVER CHALK of the ancients, is of a snow white colour, and its texture is somewhat loose and spongy, for it is very light, and has a rough uneven surface. It easily breaks between the fingers, and has a taste like that of Pumice-stone, but with no sandy grittiness. It grows hard in the fire without changing colour, and it is found in *Prussia*, where it is used for cleaning and polishing silver vessels, from whence it has its name.

The Yellow TRIPOLI, is of a firm texture, and moderately heavy; it is only yellowish in the Earth; for when it is dry it becomes white, and almost as hard as a stone. In the fire it turns to a beautiful pale red; it is found in several parts of *Europe*; but the greatest quantity is met with in *Africa*. It is called Tripoli from a city of that name in that part of the world. This and the former, as well as all of this kind, are composed of harder particles than Oker, for which reason they are of greater use in polishing metals.

Reddish White TRIPOLI never makes a stratum in the earth of itself, but is found in distinct masses among other strata. It is pretty hard, though of a loose texture, and consists of a multitude of plates or flakes

flakes lying upon each other. It is met with in *Germany*, and on *Mendip Hills* in *England*. It is used in polishing brass.

The Melian EARTH of *Dioscorides*, is a hard heavy ash coloured Tripoli, and is of a loose, open, spongy texture, very readily falling into powder, it being very brittle. It consists of very harsh particles, and is extremely rough to the touch. It has a disagreeable styptic taste somewhat like Allum; but the fire makes no great alteration in it. It is found in the islands of *Archipelago*; but it is not much known in *England*, and consequently not used by workmen.

Light Brittle Greenish Red TRIPOLI, is of a loose spongy texture, and remarkably light, with a rough uneven surface. It easily breaks between the fingers, but does not colour the hands, and it undergoes no alteration in the fire. It is found in several parts of the world as well as in *Somersetshire*.

ROTTEN STONE, is a sort of Tripoli of a brown colour, and is very soft and light while in the earth; but out of it becomes more hard. Its texture is light and spongy, and it is dry, hard, and rough to the touch. It becomes a little more hard in the fire, and acquires a reddish cast. It is found in *Derbyshire*, *Shropshire*, and *Somersetshire*, and is of great use in polishing brass.

Hard Pale Brown TRIPOLI, has sometimes a little cast of red, and is somewhat heavy, it being of a close compact texture, and almost as hard as a stone; but it is more smooth than other Tripolies. In the fire it becomes more reddish. It is found in *Wiltshire*, serves for the same purposes as the former.

Sparkling Brown TRIPOLI, is the heaviest of all of this kind, though it is of a loose texture. It seems to abound with a sort of spangles that glitter pretty much, though the surface is rough and irregular. It ferments briskly with aqua fortis, and in the fire becomes of a fine red, and pretty hard. It is not very uncommon in *England*, but has never been put to any use.

Brownish Red Sparkling TRIPOLI, is very light, it being of a looser texture than any of this tribe; but

but it is full of a great number of large glittering particles, and has a rough irregular surface. In the fire it undergoes little alteration, and it is found in *Wiltshire*, *Suffex*, and other parts of *England*. It is not fine enough to be used for any thing else but polishing Brass.

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C H A P. VII.

Of ISING-GLASS, MOSCOVY-GLASS, and FALC.

ISING-GLASS consists of shining scaly particles, or flat plates, and that called *Moscovy* Glas is of the same nature; or rather, both these names are given to the same substances.

White Shining ISING-GLASS, is usually found in masses of a smooth and even surface, except at the edges; it is sometimes from eight to twelve inches broad, and from half an inch to three thick. It will cleave into innumerable thin plates or flakes, and is as transparent as the finest glass, instead of which it is used for putting before small prints generally designed for children; as also by some miniature painters for covering their pictures. They may be split, with care, so as not to be thicker than leaf gold, and yet still have a sort of springiness or elasticity, for which it is very remarkable. In the fire it becomes as white as silver, but then it ceases to be transparent. It is found in various parts of the world, particularly in *Russia* or *Moscovy*, from whence it has its name. It was formerly of more use, before the invention of glass, than it is at present.

Bright Brown ISING-GLASS is not so beautiful as the former; but it has much the same texture, and like that, will cleave into plates or flakes; but the surface is not quite so even. It is very bright, though not so transparent as the former, and is more subject to flaws and cracks. It soon becomes white and opaque in the fire, and then readily breaks to pieces afterwards, though it seems to be adorned with silver

spangles. 'Tis found in *Germany*; and, it is said, there have been small pieces of it met with in *England*.

Bright Purple ISING-GLASS is as even and regular as the first kind, and may be cloven into as many flakes as that. While the flakes are pretty thick they are of a fine beautiful colour like an amethyst; but when split into thinner plates it becomes paler, and in the thinnest of all the colour is wholly lost. It also loses its colour and transparency in the fire, becoming entirely white. It is found in *Moscow* and *Persia*, and by some it is called red TALC.

TALC is a shining stone which will split into very thin plates that are transparent and a little flexible. It will not melt in the fire, nor will it admit calcination, nor lose its colour. It is of various kinds.

VENETIAN TALC is well known for the several attempts that have been made to reduce it into a sort of paint to beautify ladies faces. *Linnaeus* calls it Whitish Talc, consisting of plates almost transparent, which feel like suet to the touch. The masses of *Venetian* Talc are from one to five or six inches in diameter, with a very rude irregular surface, full of prominences and cavities. It is of very little use in medicine, it being employed only as a cosmetic to render the skin more white and shining. The best way is to reduce it into an impalpable powder, the shortest way of doing which is to heat it red hot in the fire, and then quench it in cold water; this must be done several times, after which it may be ground upon a porphyry into an exceeding fine powder shining like silver. This, when mixed with pomatum, is what the ladies call cold cream. The chymists have endeavoured to get the oil of Talc, but without success; though they suppose it would turn brass into silver. If any thing of this kind has ever been procured, it has been owing to the additions, and not to the Talc itself.

Shining Black TALC with small leaves is of an irregular complicated texture, like the former, and is found in masses, which have a rugged surface, from one to four inches in diameter. They are composed of a prodigious number of irregular scales very closely

ly but unevenly laid together, which will easily split into irregular flakes. None of the TALCS nor yet the ISING-GLASSES can be made to strike fire with steel, for which reason they are called by *Linnaeus*, *Apyri*, that is, without fire. They likewise remain unchanged in the fire, and cannot be dissolved by acids.

Shining Gold Coloured TALC with small spangles, is called by some writers *Mica aurea* from its shining like gold. It is found in small masses of a loose, irregular brittle texture with an uneven surface, but never exceeding an inch and a half in diameter. It is composed of a multitude of small flakes or spangles, with sometimes a mixture of a sort of crystal. These flakes are very small, being seldom above a quarter of an inch broad; but they are extremely smooth and soft to the touch. It is found in several parts of *Europe*, particularly in *England*.

Shining TALC with the appearance of silver, has spangles of various sizes, and is known to some by the name of *Glimmer* or *Cat-silver*, and is very brittle, readily parting into the flakes of which it consists. The masses are very small, being seldom above the fifth part of an inch in length. It is found in several parts of *Italy*, as well as in *England*; and in some places looks like shining sand.

Greenish Shining TALC with very small spangles, is of a very pure kind, though it does not shine so much as the two former; but it is very brittle, and of an irregular shape, with a rough scaly surface. Its masses are found from one inch to eight or ten in diameter, which seem to be composed of very small spangles, which will readily stick to the fingers in handling. It is found in great plenty on the Shores of *Italy*, and there has been some found in *England*, on *Mendip* hills, but in no great quantity.

Greyish Green TALC with small scales, is of a very dull colour, and has a distant resemblance to the *Venetian* Talc, though the structure is very different. The flakes are of various sizes, but usually small, and lie in various directions, being of no determinate shape, and they are not so transparent as the other

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kinds. It is found on the shores of *Yorkshire* and *Lincolnshire*.

Grey Shining TALC with very thin scales, is rather brighter than any of the former kinds, and it consists of a vast number of plates or flakes, lying in a very confused and irregular manner, and of various sizes and shapes, the larger not being above half an inch in breadth. In the fire it turns as yellow as gold, and shines like it, it being the only Talc that changes in the fire. It is very common on the *English* shore.

Bright Green Shining TALC with broad spangles, is found in masses that are composed of others that are smaller, and these consist of very fine thin plates, which are generally wrinkled and turned several ways. The colour is very beautiful when unbroken; but when the flakes are separated from each other it is quite lost. It is considerably heavy, and loses its greenness and transparency in the fire. It is found in the beds of rivers in *Italy*.

Shining Greyish Yellow TALC with small scales, makes a very splendid appearance, and is found in masses of eight or ten inches in diameter, which are composed of a great number of very broad, thin, light flakes. The surface is bright and glossy, but never even. In the fire it loses all its yellowness. It is found very frequently on the shores of *Italy*.

White Sweet-Scented TALC with undulated scales, is by some authors called the *Violet* stone, on account of its smell. It is found in masses of a very compact and firm texture, though rough and irregular on the out-side; these are from an inch to twelve in diameter; they consist of a prodigious number of thin snow-white flakes adhering very closely to each other. These are of various sizes, without any regularity, and lie in all directions, being as soft to the touch as those of the *Venetian* Talc. In the fire it turns to a dusky brown red. It is common on the shores of *Italy*, and on the mountains of *Germany*.

Linneæus has ten sorts of TALCS; namely, the *Venetian* TALC, consisting of impalpable particles that are transparent, soft, convex and fissile; otherwise Whitish TALC with almost transparent plates. The
horny,

horny, hard, black, solid TALC, consisting of a thick solid stone, having a surface as smooth as if it was covered with oil. The TALC that is fit for making vessels, which is pretty solid, of a greenish colour, spotted and will admit of a polish; it is used for making various kinds of vessels. The horny fissile TALC with parallel plates. The TALC consisting of impalpable particles or plates that will readily bend. The TALC consisting of a stone that will cleave into plates like common TALC, which are thick, rough, opaque, and of a flesh colour; when burnt, it will cleave like Ising-glass. The TALC that consists of dispersed plates, are a little scaly, and being wet is always of a greenish colour. It is used instead of potter's clay for making a sort of vessels; for it may be easily worked, and is of a blackish grey colour, whose flakes will cleave like Ising-glass, and in the fire it turns reddish. Some employ it in the making of chimnies, and for the foundation of houses. The solid half transparent TALC of the painters, which consists of a very soft stone having the appearance of suet. The TALC consisting of a sort of plates like brass, or scales that are opaque and stiff; and the TALC composed of stiff crooked bundles of plates or fibres, which are variously complicated, and as hard as a stone.

Besides these, there are other TALCS not so easily cloven as the former, which consist of small plates in the form of spangles, and consequently are very distinct from the former.

The Shining Blueish Brown TALC is usually found in masses of a pretty firm compact texture, with rugged unequal surfaces, and in the shape of pebble stones, from the size of a horse-bean to five or six inches in diameter. It consists of small, but generally thick spangles cohering firmly to each other, and, though irregular, nearly of the same shape. They are very hard and harsh, feeling more like stone than common TALC, and consequently are hard to be separated from each other. They are very heavy, and yet will not strike fire with steel; but the fire will bring them to a pale reddish grey without transparency.

Dull Pale Red TALC, with scales of various sizes, is usually found in masses from two to eight inches in breadth. It is composed of a vast number of scales that lie closely together in a very agreeable order; but they are mixed with an opaque substance of the same nature with the scales, only they are not of the same shape, nor well disposed. They seem to have very smooth and even surfaces, and are as soft to the touch as *Venetian* Talc, to which they seem to have some distant relation; though it is considerably heavy, it will not strike fire with steel, but will turn in the fire to a pale whitish grey. It is very common on the shores of *Lincolnshire*.

Heavy Shining Orange coloured TALC with thick flakes, is usually found in rugged irregular masses that seem to be broken, and from three to eight inches in diameter. They are composed of a small number of plates, in comparison of most of the other kinds, and these are very thick, large, and firm, cohering strongly together, but in all angles and directions. They may be easily broken transversely by bending them three or four times backwards and forwards. Though they are remarkably heavy, they will not strike fire with steel; but in the fire they turn to a pale yellowish white, with a small mixture of carnation. It is common on the shores of the rivers in the *East-Indies*.

Bright Purple TALC with thick scales, is usually found in extremely rough coarse masses in the *East-Indies*, from one to five inches in diameter; they are composed of a small number of very large thick flakes, cohering very strongly together, but very irregularly placed, and yet are almost as soft as *Venetian* Talc; but they may be easily broken transversely with very little force. The colour is so bright and elegant that it might not be improperly placed among gems, it being transparent when held up against a strong light, but a small stroke of a hammer will break it to pieces. In the fire it will turn to a pale flesh coloured opaque mass. It is diuretick, and esteemed by the *Indians* to be good against the stone.

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There are other TALCS that seem to be chiefly composed of fibres or filaments, and are, therefore, by authors called fibrous Talcs.

ENGLISH TALC, so called in the shops, is of a coarse, harsh, rough kind, with an unequal surface, and of a loose brittle texture. It is found in masses from one to eighteen inches broad, and seldom more than two inches thick. It has a rough, irregular, wrinkled surface, and consists of considerably long coarse fibres, that run pretty regularly through the whole mass. It may be easily cloven according to the directions of the fibres, which, however, are so brittle that they seldom come off whole. It is of a dull, dead, whitish colour, and the filaments, when separated, appear a little glossy. It will not strike fire with steel, but when calcined it turns to a perfect white. It is found in clay and marl pits, as well as among the strata of gravel and the fissures of stone, and it will burn into a very good plaster, for which reason it is called the plaster stone; when burned it is used for cleaning silver lace.

Glossy Yellowish White TALC with broad strait fibres, is of a very close texture, and is found in thick flat masses of a very beautiful straw colour, but is seldom three inches over either way. It is composed of filaments that are perfectly strait, and may be very easily cloven; but the fibres cannot be divided singly from each other they are so very brittle. It turns in the fire to a pure white, and is found in the stone pits of *Northamptonshire*.

Bright White TALC with broad filaments is of a loose brittle texture, and is found in large broad and pretty thick white masses, and where fresh broken it is very glossy and bright. The filaments are much broader at the top than at the bottom of the mass, it being above an inch upwards, and very even and glossy; they may be cloven very thin, but they will not bend, having no spring. It calcines in the fire to a white plaster, and is very plentiful in the allum pits of *Derbyshire*.

Flesh-coloured Fibrous TALC with narrow filaments is not so bright as others of this class; but it is

of a fine smooth close and compact texture. Its horizontal surfaces formed by the ends of the fibres, are smooth and even but not glossy. The masses are from three to twelve inches broad, and sometimes five inches thick. It consists of single fibres which run throughout the whole length of the mass without interruption, but they are very brittle though smooth and glossy. It will easily calcine in the fire, and will turn into very good plaster. It is chiefly found, at present, in *Yorkshire*.

Dull White TALC with very sharp narrow filaments, is of a very compact firm texture, though it is only found like white veins in other substances, particularly red marl. The fibres are of various lengths, but they are all continued without interruption through the veins, and are from the breadth of a horse hair to half an inch. It will not easily cleave, and when it does, it is not perfectly straight, because the filaments run a little obliquely.

The Greenish White Glossy TALC with straight narrow filaments, is of a perfectly even and regular texture, being very firm, compact and hard. It is found in broad thin masses of a fine glossy white with a greenish cast, from two to fourteen inches broad, and to an inch and a half thick. It is composed of fine regular parallel filaments, which are always straight, and yet it does not split very easily. When held up to a good light it is pretty transparent, and in the fire turns perfectly white.



C H A P. VIII.

Of FOSSILE SUBSTANCES that are not elastick, and composed of short Fibres.

SOME authors call these *Lachnides* from *Lachne*, a Greek word, signifying hair or down.

The Flesh-coloured Pale Glossy LACHNIS, with short, broad, and crooked filaments, is found in very broad flat masses of a whitish flesh colour which have
a very

a very smooth, even, and a somewhat glossy surface at the top and bottom; some of them are eight or ten inches broad, and from one to four thick; and they are composed of flat broad filaments, irregularly placed, and lying in oblique angles. These masses will cleave perpendicularly according to the direction of the filaments, though they adhere pretty closely together at their sides, and have very smooth glossy surfaces. They will neither ferment with aquafortis, nor strike fire with steel; but in the fire they will turn to a perfect whiteness. It is found in the marl pits of *Derbyshire*, but is of little use.

Greenish-White Glossy LACHNIS with broad oblique filaments, is found in large, broad, thick masses, with its horizontal surfaces very uneven, rough, and rugged. It is sometimes seen near two feet broad, and six or seven inches thick. It consists of pretty bright glossy filaments that are very broad, but placed in no regular order, nor continued through the whole thickness of the mass, which separate it transversely into several rows, separated by narrow veins of greenish white marl. The whole mass is easily cloven and separated into transparent filaments that will not bend. When in the fire it soon calcines to a white plaster.

Dull Greyish White LACHNIS with thick oblique filaments, is of an extremely compact and firm texture, and is found in very large, thick masses, from two to eighteen inches in diameter, and nearly as thick the other way. It is composed of eight or twelve rows of filaments, sometimes making angles with each other. It is not easily cloven, the filaments being so harsh and brittle, that they are separated with difficulty to any tolerable length. It is very heavy, and yet it will not strike fire with steel, nor will it very easily calcine into plaster.

Dull white LACHNIS, with straight broad filaments, is of a pretty close texture, and extremely brittle. It is found in short thick masses from two to six inches in breadth, and sometimes four inches thick. It is only composed of two rows of filaments that are pretty broad and very irregularly placed, meeting and near each other at the center; they are so extremely

brittle that they can never be cloven directly. It will turn to a very good plaster very soon in the fire, and is found in the marl pits of *Derbyshire*.

The White Glossy LACHNIS with broad oblique filaments, is of a very irregular texture, but very glossy. It is found in large flat masses, from two to ten inches broad, and from half an inch to above an inch thick. It consists of several rows of very broad glittering filaments, confusedly woven with each other at their ends, and they are all very short and broad, though bent and waved in different manners, making all sorts of angles with each other. It is hard to be cloven, nor can the filaments be easily separated, they have so firm a consistence. They are soon turned by fire into a fine white plaster. It is very common in *Yorkshire* in the blue clay pits.

Dull Flesh-coloured LACHNIS with broad short filaments, is very brittle, and of a coarse, harsh, irregular structure. It is often found from eight to twelve inches broad, and six inches thick. It consists of broad, short, and very obliquely ranged filaments, divided into three or four beds, by the thick horizontal earth it is lodged in. The filaments are short and crooked, and adhere slightly to each other on the sides, which render the mass very brittle and easily cloven. It is easily burnt into plaster, and is found in the alabaster pits in *Derbyshire*.

The beautiful Flesh-coloured glossy LACHNIS, with slender filaments, interwoven with each other, is of a very short, fine, smooth, equal texture, and is extremely firm, compact, and hard. It is found in flat masses, from four to six inches broad, and seldom above an inch thick. There are four or five rows of fibres that go to the making up less than an inch in thickness. It is difficult to cleave, the filaments being not easily separated from each other. It may be calcined very soon to a fine white plaster. It is found in *Somersetshire* and other places.

The Blueish-White LACHNIS, with very narrow straight fibres, is of a fine smooth texture, and pretty compact; it is found in flat masses from ten to fourteen inches in breadth, though seldom above an
inch

inch thick. It is composed of three or four rows of orders or filaments standing perpendicularly on each other; these filaments being straight renders the mass easy to be cloven or split, and they have pretty smooth glossy substances. They soon calcine to a very white plaster. It is found in the marl pits of *Staffordshire*.

The Glossy Greenish-Grey LACHNIS with broad and very thin filaments, is found in masses four or five feet in breadth, though seldom above four or five inches thick. They consist of two rows or orders of filaments that are interwoven with each other at their internal ends; but they are always bent, and often placed obliquely. It will calcine, though but slowly, to a very white plaster.

The Glossy Greenish-White LACHNIS, with narrow bent filaments, is found in masses frequently as thick as broad, being sometimes no more than an inch in diameter, and at other times twelve inches. It is composed of many rows of interrupted filaments, variously bending and intersecting each other, which have very smooth unequal surfaces; though they are very hard and heavy they will not strike fire with steel, and they calcine very slowly in the fire. It is found in the marl pits of *Derbyshire*. All these Lachnides may be accounted a sort of Talc, or at least akin thereto.



C H A P. IX.

Of FOSSILS called ASBESTOS and AMIANTHUS.

MOST authors that have treated upon fossils make Asbestos and Amianthus to mean the same thing; that is, what some call Earth-flax, and others Plumous Allum; but this last name has been very improperly applied; for the Plumous Allum is a real salt, which is found in an island of the *Archipelago* called *Melo*. However *Linnaeus* makes a distinction between Asbestos and Amianthus; for he would have the latter to

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consist of longitudinal fibres, and the former of those
that are interwoven.

Incombustible flax is a sort of Amianthus, and consists of flexible fibres, like thread, lying parallel to each other, and easily separated. The ancients spun these fibres, and made a sort of cloth thereof, in which they wrapped up the dead bodies they intended to burn, that they might preserve the ashes; for when the body was burnt the cloth remained entire. The *Germans* call it mountain flax; and it is found in *Lapland*, *Siberia*, and in the vallies of the *Pyrenean* mountains; but the largest quantity is brought to us from *Negropont*. Some chymists make use of this, instead of wicks for lamps, but it is not proper for that purpose. When handled it causes an itching in the skin, and sometimes blisters, which is owing to the fibres or downe, of which it is composed, getting into the skin; however, it is easily cured, by rubbing the part with oil, which will soon blunt the points of the down.

There is another Amianthus, with angular, rigid, opaque fibres, which some call Asbestos, with hard parallel fibres, not to be separated from each other. These are of an ash colour, and the whole has pretty much the appearance of wood. It is found in *Lapland*, *Sahlberg*, and other places. There is another Amianthus, consisting of stiff fibres that are easily separated from each other; but they are as brittle and transparent as glass, and of a greenish colour. A fourth sort is known in the shops by the name of Plumous Allum, and consists of exceeding brittle parallel fibres, that can hardly be separated from each other. It is found in *Sweden*.

Linnaeus has also three sorts of Asbestos; namely, that which is heavy, and consists of hard fibres, formed into a sort of flakes or plates. It will readily cleave, and is of a pale colour; but is so heavy it will not swim in water. The *Swedes* call it mountain flax. Another Asbestos is membraneous; that is, it consists of fibres so interwoven, that it resembles old leather. It will swim upon water, and the surface of it is hard, smooth, light and white. The third sort consists of
flexible

flexible fibres that cross each other irregularly, and is so light that it is called by the *Swedes* mountain-cork; and indeed it looks like the inward bark of cork, and is so porous a stone that it will swim in water.

Other authors have the Greenish Asbestos, which is extremely smooth, firm, compact, and exceeding soft to the touch. It is found in the form of veins in a sort of marble; and its filaments are slender and bent. It is met with in the isle of *Anglesea*, and other parts of *Wales*, in lumps, seldom larger than a nut.

Whitish-Brown Silky ASBESTOS, is called in *America* petrified wood, its texture being even, regular and close. It is extremely soft and silky to the touch, and of a whitish-brown colour. It consists of long continued flat filaments, and is found from one to three inches long.

Greyish Silky ABSESTOS, with very long continued and roundish fibres, which run in straight lines the whole length of the whole mass. It is found in lumps from two to nine inches long, and the fibres are so placed as to make it look like a piece of wood. It is found in the Highlands of *Scotland*.

Greyish-green Silky ABSESTOS, with long continued and very slender fibres, is found in the isle of *Cyprus*, in bits, not exceeding a quarter of an ounce in weight, though sometimes three inches long, and half an inch broad.

White, Loose, Thready ABSESTOS, with broad fibres, is found in length from two inches to twelve; and sometimes the fibres seem to be bundled up like the threads of cotton in the wicks of lamps. This is found in the Highlands of *Scotland*.

Soft, Reddish-Black AMIANTHUS, with short, abrupt filaments, is found in the strata of iron ore, forming veins of an inch in diameter sometimes, but seldom so large. In the fire it turns to a very pale red. It is common in *Germany* among iron mines.

Greyish-green, rigid AMIANTHUS, with short, abrupt, and interwoven fibres, is said to be the Pluvious Allum of the shops; though *Linnæus* affirms it is an Asbestos. He has also another called the greenish-brown soft Amianthus, with very short, abrupt, slender,

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der, and interwoven fibres. They are found in the
quarries of greenish and greyish marble in many parts
of *Wales*.

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CH A P. X.

Of the FOSSILS called GYPSUMS.

AUTHORS are not well agreed what Gypsum properly signifies ; for some would have it to be the lime of alabaster, others a sort of plumous allum, others Ising-glass, and others again the lime of the stone called Selenites ; but it is more generally taken for the lime of certain whitish stones, which, when burnt, contain some shining particles like Talc ; and which are required to be but a short time in the fire before they turn to lime. But the Gypsum that is meant here includes those sort of fossils that are composed of small flat particles, which are ranged irregularly, and give the whole masses somewhat of the appearance of softer marble ; they being bright, glossy, and in some degree transparent. They will very easily turn to lime in the fire.

Hard white GYPSUM, or plaster of *Paris* stone, has somewhat the appearance of loaf sugar ; it being pretty fine, and of a very close, firm, compact texture. It is found in masses from four inches to four feet in diameter, and, when broken, shines like crystal. In the fire it readily turns to a very fine plaster. It is chiefly found in *France*.

Hard Shining red and white GYPSUM, that has the appearance of marble, is found in masses four or five feet in breadth, and three in thickness, with a rough, dusky, dark surface ; but when broken it is bright and glossy. It does not turn into plaster, when calcined, so soon as the former. It is common in *Yorkshire* and *Derbyshire*.

Hard Greyish-white GYPSUM, is found in masses about six or seven inches broad, and three thick, with a very rough, rugged, uneven surface, and a coarse,
dull,

dull, dead look; when broken it does not sparkle like the other kinds. It is common in *Germany* and *Derbyshire*.

Soft, Shining, Green GYPSUM, is found in lumps four inches broad, and more than one thick. It is of a very dull, dusky, brownish colour on the outside, but when broken is very glossy, though it seems to be a little spongy. It is very soft and brittle, and loses its fine colour before it is quite calcined in the fire. It is found on the shores of rivers in the *East-Indies*.

Soft White GYPSUM, commonly called *Derbyshire* plaster stone, is found in lumps from the size of an egg to two or three feet in diameter, which are opaque, and of a dusky brownish-white; but, when broken, pretty bright and glossy. It is of so soft and brittle a texture that it will break with a small force. It becomes very white when calcined, and makes a very valuable plaster. It is found in many parts of *Derbyshire*.

Soft, Pale-brown, Glossy GYPSUM, is generally found in thin masses, seldom above a foot broad, and three inches thick, with a rough unequal surface; but, when broken, it has the appearance of marble, being extremely bright and glossy, and composed of very large broad particles. It is very soft and brittle, as most of this kind are, and readily calcines into a pure white plaster. It is found in some parts of *Germany* as well as in *Derbyshire*.

Soft Red GYPSUM is sometimes met with in small lumps, not much bigger than a walnut, and at other times in masses of ten pounds weight, with a very rough, dull, unequal surface; when broken, it sparkles, but not very much. The texture seems to consist of different rows of short lines or streaks, variously intersecting each other. It is very brittle, and and calcines very easily in the fire, making an excellent plaster. None of these Gypsums will ferment with aqua fortis, or strike fire with steel.



C H A P. XI.

Of the SELENITES.

THE Selenites are stones consisting of slender fibres, ranged into fine even flakes of different forms, according to their kinds. They will cleave like Talc, not only horizontally but perpendicularly; and though they will bend a little, they have no spring. They will not ferment with aquafortis, nor readily calcine in the fire.

The Thin, Fine, Transparent SELENITE with transverse streaks, is a common sort, and is met with from one tenth of an inch to five or six inches long. It has a broad flat top and bottom, and is bounded at the end by four regular rhombs, and on the sides by trapezia, and the rim or ridge that surrounds the body of the stone, is placed near the center, being the edge of the central or largest plate. It consists of fine thin plates irregularly disposed through the whole breadth of the mass. These plates or flakes easily separate from each other in an horizontal direction, being almost as apt to cleave as Talc. It is pretty soft, and as void of colour as crystal; in the fire it turns to a pure opaque white. It is found in the strata of clay in several parts of *England*.

The Thin, Dull, Opaque, Slender, Streaked SELENITE, is found from half an inch to three inches in length, and consists of a great number of even flat plates or flakes, each of which is of the same size as the horizontal surface. It is formed pretty much like the former, but not quite so regular, nor is the appearance so beautiful.

The Thin, Fine, Streaked, SELENITE with longitudinal streaks, is seldom broader than an inch, and above a seventh of an inch thick. It consists, like the former, of parallel horizontal plates; but the fibres of which they consist, are slender, straight and exceeding regular running in an oblique longitudinal di-

direction, from one end of the stone to the other. It cleaves very easily, parting into flakes like Talc, and readily calcines to a fine white in the fire. It is found in the clay pit at *Richmond*, but at a considerable depth.

The Thick SELENITE with transverse streaks and a rough surface, is usually met with of the size of about an inch and a half in breadth, and the plates or flakes of which it consists, are remarkable for the largeness of the fibres that compose them, as well as the regular order in which they are laid. It has four rhombs and four trepezia, and the top, bottom and sides like all the former; but the structure is very irregular, though it cleaves with great ease. It calcines in the fire to a perfect whiteness, and is common in *Yorkshire* and *Leicestershire*.

The Short SELENITE with thick plates, is of various sizes, but the most common is two inches in diameter; at first sight it might be taken for that first mentioned, the ridge or rim being placed in the middle of the body of the stone. It consists of a smaller number of plates than others of this kind, because they are considerably thick, and are composed of bundles of fibres running longitudinally; and they are intersected with four or five transverse streaks. The whole stone is pretty bright and transparent. In the fire it turns to an opaque white, and is very common in the clay pits of *Northamptonshire*.

The Transparent SELENITE with narrow transverse streaks, is generally between two and three inches long, and consists of very numerous horizontal plates, irregularly disposed, and of different thicknesses. They are composed of fine parallel straight fibres, running obliquely a-cross the stone from side to side. It very easily cleaves into very fine flakes, and calcines in the fire to the whiteness of snow. *Dale* takes notice of it, as being common in *Northamptonshire*, where they call it *Stanch*, because it stops blood.

The Thick, Dull SELENITE, with very fine transverse fibres, is generally about two inches long, and consists of fine thin plates, evenly disposed, without the mass; these are made of exceeding fine slender

der filaments, running transversely in an oblique direction through the stone. The plates do not separate very easily, and the whole mass is dusky, being very little transparent. It is found in the clay pits in most parts of *England*.

The SELENITE with fine longitudinal filaments, is composed, as well as the two former, of two horizontal, and two oblique planes. It is of various sizes, from a quarter of an inch to three inches in length; and its rhombs and trapezia are very unequal in size, which is the particular distinction of this sort. It calcines in the fire to a snow white substance, and is very common all over *England*.

The Brown Transparent SELENITE consists, like the former, of two horizontal, and eight lateral planes, or a top and bottom, and eight sides very evenly divided from each other, by a prominent rim or ridge running, nearly, through the center of the body. It is generally three inches long, and consists of a great number of fine, transparent, firm, parallel plates, joining exactly to each other. The plates consist of many fine filaments, all ranged in the same order, and not collected into separate bundles. It may be very readily cloven into horizontal plates that are very thin, and it calcines to a fine white in the fire. It is common in *Germany*.

The Thin Transparent SELENITE with transverse fibres, has much the same external form as the rest, but is usually very thin, in proportion to its length and breadth; its common size is about an inch long, and it consists of many thin horizontal plates or flakes, made up of parallel fibres running obliquely across. It cleaves very easily, both horizontally and perpendicularly, and readily calcines into a white mass. It is common in *Northamptonshire*, and other parts of *England*.

The Dull, Thick SELENITE, with very thin transverse fibres, consists, as well as the former, of fourteen planes, made out of the usual ten of the rhomboïdal kind, because each of the four rhombs are divided into two. It is generally between two and three inches long, and is composed of many extremely
ly

ly thin plates, that consist of an infinite number of parallel fibres that are connected into bundles and run transversely in an oblique direction. It is very brittle, but it easily cleaves, according to the horizontal direction ; and though it is as bright as the rest, it is not so transparent ; but it calcines more readily to a perfect whiteness. It is found in *Leicestershire* in the yellow clay pits.

The Long Scaly SELENITE, is commonly about three inches long, and has its rhombs full of parallel ridges, like the tiling of a house, though not very straight. Its horizontal plains are very rough and scaly, it being composed of a vast number of oblong narrow plates, falling very irregularly one over another ; it turns in the fire to a pure white.

The SELENITE with thin flakes and transverse filaments, is generally about an inch in length, and is composed of six planes that are nearly equal ; that is, a top, a bottom, and four sides. It is considerably long, in proportion to its thickness, and is composed of parallel plates lying evenly over each other in an horizontal direction, each making one whole surface of the stone. These consist of very fine slender fibres, laid obliquely a-cross the flake. It may be cloven very easily, according to the direction of the flakes ; and in the fire it turns soon into a very pure white. It is sometimes found in *Northamptonshire*.

The Dull SELENITE, with thick plates and longitudinal fibres, is exactly of the same shape as the former, and is usually about two inches long, and a little more than a quarter of an inch in diameter. It consists of thick coarse plates, whose fibres are thicker than in most others. It is of the same structure throughout its thickness, and will very readily cleave into separate plates ; it is of an opaque whitish colour ; but calcines very slowly to a fine white. It is common in clayey grounds in *Yorkshire*, lying near the surface.

The SELENITE, in the shape of a column, with very fine fibres. It is in the shape of a column, with six angles, and looks as if there was a part broken off at each end. There is no distinction of top and bottom,

bottom, and all the planes are nearly alike. It is usually about an inch and a half long, and half an inch in diameter, and consists of a great number of very bright, and fine parallel filaments. It will cleave every way, but not into flakes, and the filaments are very flexible, but not elastick. It turns in the fire to a very pure white, and is found, but not commonly, in the clay pits of *Northamptonshire*.

The SELENITE shaped like a column, with thick fibres, is pretty much like the former in shape and size, and may be easily separated into filaments, for they will split off from many of its surfaces; but they will not bend readily, for they will easily break. They are neither bright nor transparent, but of a chalky whiteness, and turn to a pure white in the fire. It is found in the cliffs in the isle of *Sheppy*.

The Colourless Transparent SELENITE, is of no regular shape, it being found in thin flat masses of different sizes and forms; that is, from one inch to a foot in length. It is composed of a vast number of minute and thin parallel flakes, not unlike *Ising-glass*. These are formed of a multitude of parallel fibres, ranged in a beautiful order. They are extremely bright and transparent, and the substance is very soft. It turns in the fire to a fine pure white. It is found in several counties in *England*.

There is another SELENITE of this kind that is whitish and dull, but not so pure as the former; but it seems to be made up of plain even flakes, like those of *Ising-glass*. It is commonly long, in proportion to its breadth, but it is a little thicker than the former. The sides are uneven and ridged, like the tiling of a house; and it is of various sizes, being from one inch to six or eight long. It calcines slowly, but at length attains a perfect whiteness. It is common in *Germany*, and is sometimes met with in the strata of clay in *Northamptonshire* and *Leicestershire*.

The SELENITE with eight sides, perpendicular plates, and obtuse angles, is always in the form of a segment of a depressed six angled column, and is composed of a top and bottom, and four trapezia; that is, two on each side, divided by a ridge, that is not readily

dily distinguished. It is always short and thick in proportion to its breadth, and is from one sixth of an inch to two inches long; but when it is only an inch, which is the common size, it is about half an inch thick and broad. It is composed of a vast number of pretty thin plates, laid evenly and regularly in a transverse order; and these consist of moderately large fibres. The flakes are very flexible, but not elastick; and they are all opaque and whitish while together. It is found in the clay pits of *Staffordshire*.

The SELENITE composed of filaments that are ranged toward the surface of the body, into broader plates, which are notched at the edges, and seem to be radiated in the form of a star. It is bright, and of a brownish white, and seems to be composed of fine thin plates, propagated from a single point, which is seldom placed in the centre of the mass. They are seldom, or never, all of the same length, there being many small ones mixed among the long, which render the whole variously jagged. The stars are usually broad and flat, having but little thickness in proportion to their extent. This stone is of various sizes; namely, from that of a barley-corn to two inches in diameter. When broken it seems to be composed of straight, even, and very fine slender longitudinal fibres, proceeding from the center, and form a mass of a very beautiful streaked texture. In the fire it turns perfectly white, and is found in the isle of *Sheppy*.

There is another SELENITE like the former, but of a coarser structure and impurer substance, though the flakes of which it is composed are very white; and in the fire it turns to a reddish white. It is found in the cliffs of the isle of *Sheppy*.

The SELENITE, composed of fibres in the form of a star, is of a brown colour, and in many things resembles the former kind. It is always found very pure and fine, but is seldom above a quarter of an inch thick. It is always in the shape of a radiated star, consisting of a vast number of long, straight, fine, slender filaments. All these filaments seem to proceed from the same point, from whence they diverge to
the

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the circumference, and are nearly of the same length.
In the fire it calcines to a pale red. It may be met
with under the cliffs of the isle of *Sheppy*.



CH A P. XII.

Of CRYSTAL.

CRYSTAL, is a soft transparent gem, that has somewhat of the appearance of frozen water, and is sometimes like an hexagon column pointed at each end; or it rather seems to be composed of two hexagon pyramids with a column placed between them.

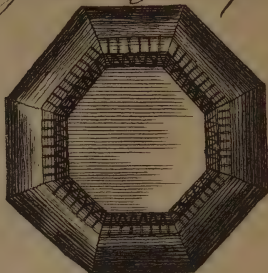
It is the softest of all gems, and when it is coloured, goes by another name, though it ought not to be substituted in the room of the more precious sorts of stones. When it imitates a Beryl, it is called a bastard Beryl; when it is like a Topaz, it is named a bastard Topaz and the like. There are many of these found in *Bohemia* and in the neighbouring parts, which can only be distinguished by their softness from real gems. There is another kind of Crystal of a rhomboidal form found in *Iceland*, and in some Parts of *France*, which seems to be composed of crystalline plates, or rather fibres, for it will cleave in all directions, and yet if it be reduced to powder, they will all preserve the rhomboidal form. It has also another singular property which is, that when any object be viewed through it, it will always appear double; but these things will best appear in the descriptions of the different sorts.

Crystals with a long intermediate column, are, the very bright CRYSTAL without any colour, which seems to be the most perfect kind, and is generally free from all kinds of blemish. It is pointed as mentioned above, and consequently consists of sixteen planes or sides in all; but those on the pyramids are not of an equal breadth, two of them being narrower than the rest. It is found from the size of a barley-corn to three inches long, but the common size is an inch. It does not depend upon any other body; but
where

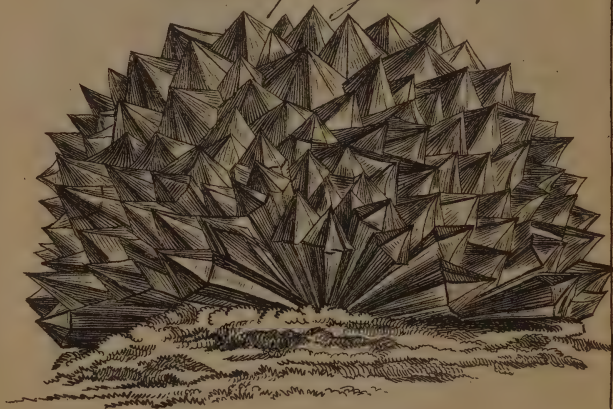
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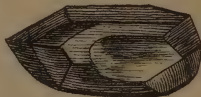
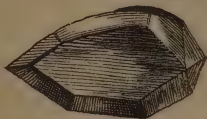
Great Moguls Topaz



Cluster of Crystals 46.



Diamonds



where one is met with there are generally more. It is moderately heavy, will strike fire with steel, and when calcined is of an opaque white. It is commonly met with in the mountains of *Germany*, but is very rare in *England*.

Blackish Bright CRYSTAL with short pyramids, is always pure and without clouds. It is of various sizes, and is most commonly three quarters of an inch in length. The numbers of sides are the same as in the former. It is harder than common Crystal, and cannot be broken without difficulty. It is remarkably bright and transparent, and has what they call a black water. It is very uncommon, though it is sometimes found among other sorts in some parts of *Italy*.

Dull whitish CRYSTAL, with irregular pyramids, has a longish and pretty thick column, and the pyramids are longer in some parts than in others. It is seldom quite an inch long, and is near half an inch in diameter. It will strike fire with steel, and calcines easily into a pure white. It is common in *Germany*, and is sometimes found in *Yorkshire* and *Cornwall*.

British colourless CRYSTAL, with long pyramids, and a short column is very bright and transparent, and the thick short column has long pyramids tapering at the end. It is usually about an inch and a half long, and three quarters of an inch thick. The planes are seldom regular, but four on the column and pyramid are frequently broader than the other two. It is so hard as not to be scratched, and is not easily broken. When calcined, which it is with difficulty, is as white as snow. It is found in *Bohemia*.

Bright Brown CRYSTAL, with short pyramids, and a very short column, is always thicker than it is long, and it is seldom or never either cloudy or foul, it is of various lengths, from the third part of an inch to three inches, and the diameter is always greater than the length. It is generally found in large parcels in the same place, and is extremely hard, breaking with difficulty, and in any direction; when calcined, it becomes perfectly white.

Yellow Bright CRYSTAL, with regular pyramids, and a short column is seldom pure, there being cloudy spots,

spots, films and streaks therein ; it is composed of eighteen sides or planes, like the rest ; that is, six on each pyramid and six on the column, and is found from a quarter of an inch to two inches in length. It is considerably hard, strikes fire with steel, and when calcined is entirely white. It is common in *Silesia* and *Bohemia*, and has been sometimes found in *Yorkshire*.

Bright Colourless CRYSTAL with a short column gibbous in the middle, is a very fine sort, and has moderately long and sharp pyramids at the end ; it is three quarters of an inch long, and a quarter and a half in diameter, and is found single, though sometimes it is met with among the strata of stones. It is very hard, strikes fire with steel, and calcines to the whiteness of snow.

Dull CRYSTAL with large pyramids, and an extremely short depressed column, is of a very foul opaque sort, and of a coarse texture, with a continual cloud throughout its whole substance. It almost entirely consists of pyramids without a column, and is found detached from all other bodies, but commonly in considerable numbers. It is not so hard as common Crystal, but will strike fire with steel, tho' not easily ; and is very white when calcined. It is seldom or never found in *England*.

Small, Bright, Blackish CRYSTAL with regular pyramids, is extremely clear and regularly formed ; it is of various sizes, the largest among them not exceeding a sixth of an inch in length, but many are extremely small. It is very hard, and is calcined with difficulty. It is found in *Germany* in the cavities of a black fissile stone.

White CRYSTAL, consisting only of two pyramids, which are short, and joined base to base, it is generally very pure, and is always found independent of all other bodies. It is not perfectly colourless, it being a little whitish ; but it strikes fire with steel very freely, and calcines very slowly.

Brown CRYSTAL, consisting of two long pyramids, without a column, is perfectly pure, and regularly formed, and is of different sizes, from the eighth
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of an inch to three inches in length, and one third of its length in diameter. It is seldom found single, many of them being usually joined together in an irregular manner; and when not joined they are always pretty numerous. It is of a very fine water, and extremely hard, striking fire with steel, and calcining slowly to a perfect whiteness. It is found in *Scotland* on the sides of hills, and sometimes on the banks of rivers.

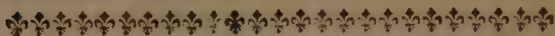
Crooked or Slanting CRYSTAL, consisting of two pyramids, without a column, is perfectly pure and transparent, and consists of an oblique, or slanting double pointed body, besides the pyramids being irregular. It is from a quarter of an inch to two inches long, and about three fourths of its length in diameter. The surfaces of the planes are all perfectly smooth; and it is found single, is of a very fine water, and is extremely hard, striking fire readily with steel. It is found in the *East* and *West-Indies*, and is common in *New-Spain*, where it is highly valued.

Bright Blackish CRYSTAL, consisting of two very short pyramids, without a column, is a very fine sort, and appears as bright as any stone of this kind. The two pyramids join evenly base to base, though sometimes one is a little larger than the other. It is commonly found in lumps, consisting of several of these Crystals pretty close together; however, at other times they are loose and independent of each other. It has a fine, blackish hue, and is very bright, with a fine water. It is extremely hard, strikes fire with steel, and after a long calcination becomes white. It is found in *Italy*, *Germany* and *France*.

CRYSTAL consisting of two pyramids only, with eight sides each; that is, having sixteen planes in all, and of a brownish colour, is of a very uncommon kind; it is fine and clear, though often spotted with large blotches of black. The pyramids are much of the same length, and the planes are extremely smooth; sometimes a hundred, or upwards, are found together, but detached from each other. It is considerably hard, strikes fire with steel, and calcines to a pure white.

It is found in *Virginia*, on the sides of hills, among a sort of iron ore.

CRYSTAL without colour, consisting of two longish pyramids, with eight sides each, is a very pure sort, and very fine and clear; it is usually near an inch long, and a third of an inch in diameter, with the planes entirely smooth polished and even. It is usually found single, is very transparent, and of a very fine water, as well as extremely hard. It is very scarce, and, as yet, has been found no where else but at *Goss-lear* in *Saxony*.



C H A P. XIII.

Of Imperfect CRYSTALS.

SPRIG CRYSTAL is whitish and transparent, and has only one pyramid with six angles, besides the column; it is an exceeding common sort, and is very regularly formed, though it is subject to variety of blemishes. The column is always long and slender, and fixed at one end to some solid Fossil; and consequently the hexangular pyramid must be at the other end. The length is from a tenth of an inch to ten inches and longer; the planes are irregular as to length and breadth, and they differ so much from each other, that scarce any two of these Crystals are found exactly alike. They are, almost always, found in clusters, are very hard, strike fire with steel, and calcine, after some time, to a pure white.

Bright imperfect CRYSTAL, without a tinge of any colour, is, by many, confounded with the former; but it is different from it, and is often sold by dealers for a white sapphire, because it is somewhat like it; it is perfectly clear, and generally pretty regular, and has a long slender column with six angles, terminated by a pretty long hexangular pyramid; it is from one tenth of an inch to three or four inches long; but it is most commonly about an inch and a half. It is not found in such large clusters as the former,

mer, but is extremely hard, strikes fire with steel, and calcines very slowly to a pure white. It is found in the *East* and *West-Indies*, as well as in *Germany*; sometimes it is so tinged as to imitate gems, and may be readily mistaken for them.

Dull Whitish imperfect CRYSTAL, with a very short pyramid, is remarkably coarse and impure, not with having a film or cloud, but by being whitish throughout its whole substance; it consists of the same planes as the former, and is usually long in proportion to its thickness in the column; but the pyramid is always short; and it is met with from a quarter of an inch to four inches long. It is generally found in large clusters; but it is not so hard as most of the rest; for it will not readily strike fire with steel, and yet it calcines slowly to a pure white. It is found in most parts of *Europe*, and particularly in *Cornwall*.

Bright Brown imperfect CRYSTAL, with a long pyramid, is generally known by the name of brown Crystal, and has a very fine clear texture. The form is generally regular, it having a long and pretty thick column, and is found from the size of an inch to an inch and a half in length, though some have been met with ten inches long. There are seldom found many of them together, though sometimes clusters have been met with; it is extremely hard, strikes fire with steel, and calcines, at length, to a pure white. It is found in the *East* and *West-Indies*, as also in *Silesia* and *Bohemia*, as well as in the islands of *Scotland*.

Dull Brown imperfect CRYSTAL, with a short pyramid, is sometimes mistaken for the former, though it is not near so good, it having a dull and dead aspect. The column is regular, but always slender in proportion to its length, and is from half an inch to fourteen inches long. The planes are the same as in the former, but the pyramid is always short; it is commonly found in clusters, but the columns do not adhere to each other, as the former; and its brown colour is of various degrees, for some are pale, and others almost black; it is tolerably hard, strikes fire with steel, but

will not readily calcine. It is very common in *Germany*, and is found in the cliffs of rocks.

Bright Brown imperfect CRYSTAL, with a short pyramid, is often tinged with various colours, but most frequently a pale yellow, and then it is sold for a *Saxon* topaz; it is extremely pure, and of a bright fine texture, though often covered with a rough coat. The column is long and slender, with a short hexangular pyramid; and it is generally met with about two inches long, and not quite half an inch in diameter, but the planes are irregular; it is commonly found single, though sometimes in large clusters, and is extremely hard; it strikes fire with steel, and, after a considerable time, calcines to a pure white. It is found in the great mine at *Goslaer* in *Saxony*; as also in *Virginia*.

Bright Brown imperfect CRYSTAL, with a very long irregular pyramid. This is called the Beryl by some jewellers, and it has the greatest lustre of all the brown Crystals; but it is not very large, being only from half an inch to four inches long, and has a thinner column than others of the same length. The planes are the same in number as in others; it is very hard, strikes fire readily with steel, and calcines very slowly. It is found in *Italy* and *Germany*; and is commonly called by the jewellers, the Beryl Crystal.

Whitish imperfect CRYSTAL, with a very long pyramid, is, by some authors, called the *Iris* or Rainbow Crystal; it is remarkable for reflecting different colours, whence it has its name, and *Boet* particularly affirms, that all the colours of the rainbow may be seen in it. It is not very pure, for sometimes there are large white flaky blemishes, but the form is perfect and regular; it is usually long and slender, and is found from one inch to eight inches long; however, it is most commonly about three inches. It is often met with in clusters of forty or fifty together; but the columns singly touch each other; it is pretty heavy, strikes fire with steel, and in the fire readily calcines and turns white.

Bright Yellow imperfect CRYSTAL, with a short pyramid, called *Citrino* by the jewellers. *Boet* affirms, that when this sort of Crystal is yellowish, it is called *Citrino* by the *Italians* and *French*, and is more valued than the common Crystal; it is very clear, pure, and of a fine texture, it being generally free from blemishes, and is from one to five inches in length; but commonly much thinner at the top than near the root. It is mostly found single, and is of a very beautiful yellow; it is not extremely hard, but it will strike fire readily with steel, and calcines slowly to a whiteness in the fire. It is found in *Bohemia* and the *West-Indies*, and is made use of for stones to set in rings.

Imperfect CRYSTAL, with a short pyramid and a thick reddish crust. This may be always known by its coat; and yet within it is perfectly fine and without colour, being very seldom subject to blemishes. But notwithstanding its crust it is always perfectly formed, and is pretty thick at the base, gradually tapering towards the top. It is from two inches to six or eight long; but the most common size is between two and three inches, the pyramid is always composed of irregular planes, and is short in proportion to the length of the column; but those of the column are pretty exact with regard to their breadths; it is seldom found single, for there are generally two, four or more columns which grow in a cluster together, and sometimes adhere very slightly. It is very hard, and will not readily calcine in the fire, but at length it becomes of a pure white.

Short, Bright imperfect CRYSTAL, without any colour, may be distinguished from all others, by being very short in proportion to its thickness; it is almost always extremely pure and without blemish, and its figure has little variation. It is always fixed to some body or other, and is found of various sizes, from half an inch to three inches long, and the diameter is commonly two thirds of the length. A cluster of eight or ten of these is generally found together, but the columns seldom touch and never adhere. It is remarkably hard, and will admit of a fine

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polish. It is found in *New-Spain*, and other parts of
America.

Short, Dull, Dusky, Brown, imperfect CRYSTAL, is as short as the former ; but then its pyramid is short in proportion ; its texture is very coarse and impure, and yet its figure is always regular and constant ; it is usually an inch and a half long, and about two thirds of its length in diameter. The pyramidal planes are all short and broad ; but two of them are broader and longer than the rest, and the planes of the columns are much the same ; it has a very little root, by which it adheres to other bodies, and is not hard as most other Crystals. It calcines pretty slowly to a sort of a pale flesh colour. It is common in *Germany* and has been found in *Yorkshire*.

Whitish imperfect CRYSTAL, with a short pyramid, consisting of five sides, with a column that has the same number ; it is an irregular formed body of a certain and determinate figure, with a pretty fine pure texture, though it is subject to flaws, clouds, and white opaque flakes, which give the colour of the rainbow by reflexion. The pyramid is very broad and short, and it is generally very small, though it is sometimes found two inches in length. The planes of the pyramids are perfectly smooth and glossy, but those of the columns are very faintly marked with transverse streaks. The root by which it adheres to the stone is white and opaque, and it is commonly found in pretty large clusters. It is met with in *Germany*.

Bright imperfect CRYSTAL with a large pyramid, consisting of five sides as well as the column, is of a very pure sort, and extremely fine ; and there is little or no variation in its shape. The most common size is about three quarters of an inch in length, and three of the planes in each part are broader than the other two. It is perfectly colourless, has a fine deep water, and is very hard. The larger single specimens are brought from *Germany*, though it is found in the lead mines on *Mendipp* hills, and the tin mines of *Cornwal*.

Brown imperfect CRYSTAL, with a rough coat, and five planes on the pyramid, as well as on the column. The coat is coarse and opaque, but the inside is never subject to any foulness. The column is thick and short, and the pyramid pretty long and slender; the most common size is three inches long, and near an inch and a half in diameter, and there are two broad planes on the pyramid as well as on the column. The root is very small and inconsiderable; and it is usually found single, of a very beautiful brown, and extremely transparent; and of a fine deep water. It is extremely hard, and calcines very slowly to a pure white. It is found in the *East-Indies*, and is in high esteem among the jewellers, it being the finest of all brown Crystals.

Brownish-white imperfect CRYSTAL, with a long pyramid, has twenty-four planes; that is, twelve on the pyramid and twelve on the column. The texture is pretty fine, pure and clear, though sometimes subject to foulnesses from flakes. It has a regular, pretty long and slender column, and is about three inches long, and little more than half an inch thick. The planes are all irregular with regard to breadth, and sometimes there is a part of them wanting. The root of this kind is long, large and whitish, and is usually found single. It is very hard, and calcines slowly into a perfect whiteness. It is found in the mountains of *Silesia* and *Bohemia*, as well as on the shores of rivers, and is in high esteem.

Yellowish-Brown imperfect CRYSTAL, with a short pyramid, having twelve planes on the pyramid, and as many on the column. It is of a pure, perfectly fine sort, and is seldom subject to blemishes, though there are sometimes found very small flakes of a whiter substance. The column is long and slender, and the usual size is about an inch in length. The planes are very irregular, with regard to breadth, and the pyramidal planes differ greatly in length as well as in breadth. It is extremely hard, and will calcine at length to a pure white. It is usually brought over with the *Saxon* topazes.

Clear Colourless imperfect CRYSTAL, with a very short pyramid, and twelve planes on the pyramids, as well as on the column. This is extremely clear, pure, and of a very fine texture, without the least spot or blemish. It is from one to two inches long, and some of the planes are broader than the rest. The surfaces of those on the pyramid are perfectly smooth, and those on the columns have deep ridges. It is commonly found single, is perfectly transparent, and has a fine bright water. It is remarkably hard, and is found in the *East-Indies*.

Colourless, very Bright, imperfect CRYSTAL, with a pretty long pyramid, which has twelve planes, and the column as many. It is generally found in clusters, and is a pure, elegant, regularly formed Crystal, though generally very small, it being not above an eighth part of an inch in length, though it has been found half an inch long or upwards. The planes seem to be nearly all of a breadth, and of the same length, and the top of the pyramid stands over the centre of the column; the planes of the pyramid are always smooth, having a high natural polish, and a fine lively dark water. It is extremely hard, and is found in all parts of this kingdom, sometimes surrounding a single or double round ball, and at other times in the cracks, cavities, and clefts of flints, and other stones.

Dull Whitish imperfect CRYSTAL, with twelve planes on the pyramid, and as many on the base, resembles the former in shape, only the pyramids are much shorter and more blunt, so that they are not easily discernable. Some of these are fine, others opaque and very coarse, and are always very short; and the common sort is not above one tenth of an inch in length, though it has been seen near an inch. The root is not easy to be seen, and the Crystal itself is seldom free from mixture, it being sometimes of a faint red, or dusky yellow, and sometimes of other colours. When pure it has a pretty good lustre, and is moderately hard. It is found in various places, in considerable clusters, though it is in the perpendicular clefts

clefts of ftone in the mines of *Cornwall*, and on *Mendip* hills.

Blackifh imperfect CRYSTAL, with very fhort pyramids, with twelve planes thereon, and as many on the bafe, is thought to be the hardeft and brighteft of all the clafs. The column is fomewhat longer and the pyramid fhorter than in others of this kind. It is fo extreamly fmall as fometimes not to be difcovered, unlefs by its glittering, though there are fome the tenth part of an inch in length, and a few the third of an inch. It is fhaped like the former, and has naturally a very fine polifh. It is extreamly hard, and is found in great plenty in the foreft of *Dean* in *Glocefterfhire*.

Imperfect CRYSTAL, with a blunt pyramid, and a very fhort column, each of which has twelve planes. It is pretty pure and clean, though fometimes fubject to fpoats and white opaque flakes. The pyramid is blunt, broad, and fixed to a broad fhort column, that fometimes feems to the naked eye to be wanting. It is extreamly fmall, the ufual fize being not above the twelfth of an inch in length, and nearly of the fame diameter. There are various fizes in the fame mafs, there being fmall ones between the larger; but the furfaces are very fmooth and pretty glosfy. It is found together in large quantities, and is fometimes tinged with red or yellow. It is confiderably hard and heavy, and found in *Cornwall*, *Yorkfhire*, and other counties of *England*.

Imperfect CRYSTAL, with a very long and narrow pyramid, which has twelve planes, as well as the column. It is generally foul, though there are fome that have a very fine water. It is ufually about a quarter of an inch long, though fometimes it is half an inch. The furfaces of the pyramidal planes are very fmooth and even, and generally very bright; but thofe of the columns are faintly ridged or streaked a-crofs. It is pretty hard, and is very common in *Germany*, as well as in many parts of *England*, particularly near *King's-Wefton* in *Glocefterfhire*. They are fometimes of various colours, but chiefly yellow and purple.

Bright, Colourless imperfect CRYSTAL, with extremely thin crusts, and in the shape of a perfect cube. The planes are all very bright and glossy, and it is of various sizes, from one tenth of an inch to three quarters in diameter, of which the larger are generally found single, and the smaller in clusters. It is pretty soft, and is found about lead mines, especially in *Norfolkshire*. They are sometimes red, green, and yellow; and if they were not so soft, might properly be called gems.

Dull Whitish imperfect CRYSTAL, with a thicker crust, is, in shape, like the former, but much more coarse, and is very subject to flaws and blemishes. The size is from a quarter of an inch to two inches in diameter, and is sometimes found single, but more commonly in masses. It is sometimes green, sometimes blue, and at other times purple, but most commonly of a pale yellow; and though it is extremely heavy, it is much softer than other Crystal. It is found about lead mines.

Dull Blueish-White imperfect CRYSTAL, with a very thick crust, is of a very foul, coarse, impure texture; but it is always in the exact shape of a cube, when found single. It is sometimes found in masses two feet in diameter, and then the Crystals are irregular; the surfaces also are very uneven, and it is of a dull, obscure, dusky look, being but little transparent. It is pretty hard, and is found in *England*, where there are lead mines, adhering to various stones.

Whitish Transparent imperfect CRYSTAL, is somewhat like the common Crystal, and, at first sight, seems to have the same number of planes. It is pretty fine and pure, and is of a perfect regular form, being in the shape of a pyramid with four sides, and is pretty broad at the bottom. It is generally about half an inch high, and almost as much in diameter; but there are some two inches high. However, it is often met with in large clusters, and the largest single Crystal is no bigger than a grain of barley. When it is found single it always adheres to some fossil body at the base, and is principally met with in *Devonshire* and *Cornwall*.

Brown imperfect CRYSTAL resembles the former, it being always like a short low pyramid, very broad at the base, and without a without a column. It is usually about one third of an inch in diameter, and not much more in height. It consists of four planes, which are seldom of the same breadth, but the surfaces are very smooth and glossy, though not always. It is sometimes found single though never loose, and most commonly in Crystals, adhering to some other body; as the base and the clusters run into each other. It is very hard, and common in *Devonshire* and *Cornwall*. It is of various colours, but principally of a faint obscure red.

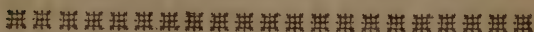
Colourless Transparent imperfect CRYSTAL, consisting of six planes, and of a rhomboidal shape, is perfectly pure, fine, clear, and broad in proportion to its length. It is very small, they being generally of the size of a grain of Wheat, and the largest are seldom more than the third of an inch in length. They are but thin in proportion to the size, and sometimes all the planes are perfectly smooth, and sometimes with ridges, appearing streaked near the extremities. It is sometimes found single and loose, and at other times in clusters that hurt each other. It is extremely heavy, very hard, and is found in pretty large quantities among the iron ores of the forest of *Dean*.

Dull, Thick, Brown, imperfect Rhomboidal CRYSTAL is not very pure, and is pretty broad in proportion to its length. It is commonly about a quarter of an inch long, an eighth of an inch broad, and about a sixth in thickness. It consists of six planes that generally appear smooth, and is sometimes found single and loose, but more frequently in clusters in the iron mines of *Gloucestershire*. It has been met with of a dusky yellow and is pretty hard. It is common in the mines of the forest of *Dean*.

Black, Glossy, Imperfect CRYSTAL, of a rhomboidal form, is extremely pure, and of a very regular shape. It is from a third of an inch to an inch in length, and is bright, smooth and glossy. The lar-

ger fort is usually single, and the small are in larger masses, of a fine blackish colour, and calcines to a fine purplish red. It is met with on the surfaces of the perpendicular cliffs, in the iron mines of *Gloucestershire*.

Very Thick, Dull, Imperfect CRYSTAL of a rhomboidal form, is extremely coarse and foul, and subject to opaque spots of a deep red, with flakes and clouds. The common standard is about half an inch, and it is long in proportion to its breadth. The surfaces are full of irregular ridges, and the large ones are sometimes found single and loose, but more commonly in large numbers. It is always of a faint, but somewhat purplish red, and is remarkably hard, calcining slowly to a deep purple. It is found in the iron mines of the forest of *Dean*. None of these Crystals will ferment with aqua fortis.



C H A P. XIV.

Of S P A R S. Of various Figures and Shapes.

SPAR, with a narrow oblong pyramid, is very like Crystal with eight sides, and is of a pure fine texture, it being the most perfect of all the whole class, having a column with six angles with a pyramid, consisting of the same number. The column is pretty long, but not thick, and the pyramids are remarkably slender and pointed. The common size is the twelfth of an inch long, though some have been seen of three quarters of an inch. The larger specimens are commonly found loose; but they are most commonly among the coarser strata of stones. It is sometimes tinged with a faint purple colour. It will not strike fire with steel, but it will dissolve in aqua fortis, and will calcine easily in a moderate fire. It is found in the mountains of *Germany*, and in *North Wales*.

SPAR, with very short pyramids and a long column; is perfectly pure and a regularly formed body, consisting of a pretty long and thick hexangular column,

lumn, terminated by a very short pyramid with the same number of sides. It is commonly about an inch long, and the third of an inch in diameter. It will not strike fire with steel, but will ferment with aqua fortis, as will indeed every kind of Spar, and therefore this needs not be repeated. It is found in *Saxony*, and sometimes in *Hartz* forest.

SPAR, with short pyramids, and a very short column, may easily be distinguished from others by its shape, and is of a pretty pure and fine texture, but not so clear as the former. It is generally found in clusters of eight, ten, and twelve together, and has a dusky hue, with very little transparency.

SPAR, with very short and broad pyramids, is extremely pure, and of a perfect fine texture, having a pretty long and thick column, with a depressed pyramid at each end, each of which has five sides. It is sometimes met with an inch long, but the commonest sort is exceeding small, and is lodged in the strata of clay. It is found in *Derbyshire*, *Yorkshire*, and *Cornwall*.

SPAR, with long pyramids and a long column, which consist each of three sides. It is pretty pure, but has a whitish cast and a dullish look. It is commonly about an inch in length, and half an inch in diameter. It is considerably heavy, but very soft and easily scratched. It is found in *Germany*, and sometimes in *Cornwall* and *Devonshire*.

SPAR, with very long pyramids and a short column, is coarse and impure, and is usually very small, though sometimes a quarter of an inch long. The columns and pyramids have each three sides. It is found in the iron mines of the forest of *Dean*.

Slender SPAR, with very short pyramids, consisting of three sides as well as the column. It is generally pretty pure, and of a fine texture, though sometimes subject to blemishes. The common size is three quarters of an inch in length, and is of a bluish white, but sometimes approaching to a lead colour, or a yellowish brown. It is very soft, and is found in *England*, *Ireland*, and *Germany*.

SPAR with flat pyramids and column, consisting of three sides each, is coarse and foul, though the figure is regular, and is of a pale brown colour, and not very transparent. It is always found single and loose, and is very common in *Saxony*.

SPAR consisting of two long pyramids without a column, each having eight sides. It is very pure and fine, and commonly about three quarters of an inch long. It is very transparent, though it is somewhat of a whitish colour, and is found in *Hartz* forest in *Germany*.

SPAR with short and sharp pointed pyramids, each consisting of eight sides and without a column. This is very pure, and is remarkable for its short points and broad basis, and is often found half an inch thick, but never longer than two thirds of its thickness. It is found in *Hartz* forest.

SPAR with short blunt pyramids without a column, and consisting of eight sides each, is much coarser than the former, and the pyramids are very broad at the base, as well as extremely short and blunt at the points. It is found from the size of a pea to half an inch in diameter, and is commonly of a dead whitish hue, with very little brightness.

SPAR with long narrow sharp pointed pyramids, consisting of six sides each, and without a column, is generally fine, clear and pure, though sometimes cloudy. It is often an inch in length, but not a third of an inch in diameter, and is very soft. It is found in the mines of *Mendip* hills.

SPAR with long broad obtuse pyramids, consisting of five sides each without a column, is sometimes of a pretty pure and clear texture, but oftner dusky and coarse; it is found from the length of a barley corn to an inch and a half in length, and not half so thick. It is very soft, and is found in the mines of *Hartz* forest.

SPAR with long and pointed pyramids, consisting of three sides and without a column. The pyramids are extremely long and narrow, but the texture is impure; the surfaces are smooth, and of a pale whitish brown

brown colour, with very little transparency. It is very soft, and found in the mines of *Cornwal*.

SPAR with long broad pyramids consisting of three sides each, and without a column, is coarse and unequal in its texture, and is of various sizes, from an eighth part of an inch to two inches long; it is whitish, greyish, yellowish, or reddish, but most commonly of a pale brown. It is found in *Germany*.

SPAR with short broad pyramids consisting of three sides each, and without a column, is very pure, fine, and clear, and is very short in proportion to its thickness. It is from half an inch to an inch and a half long, with very smooth glossy planes. It is pretty transparent, and brighter than most other Spars as well as harder, though it will not strike fire with steel. It is found in *Hartz* forest.

Extremely Broad SPAR with depressed pyramids consisting of three sides each, and without a column. It is not very clear, though not coarse, and those of three quarters of an inch broad are not a quarter of an inch long. It is very soft, and is found in *Germany*.

SPAR with short sharp pointed pyramids consisting of three sides each, and without a column, is sometimes of a fine clear texture, but frequently full of spots and blemishes. It is sometimes, though seldom, an inch in length, and the planes are even, smooth, and polished, though not very bright, and commonly of a pale yellow, but sometimes of a deadish white, or of a pale brown. It is very soft, and is found in *Hartz* forest.

Slender SPAR with a long pyramid consisting of six sides, has often been mistaken for a Crystal, it having a long slender hexangular column. The texture is extremely fine, though it is sometimes subject to flaky flaws, and is commonly two inches long, and a third of an inch in diameter. It is not so bright as Crystal, and is sometimes of other colours, which are very lively and beautiful like gems, but it is soft, and found in *Mendip* hills.

SPAR with a long irregular pyramid consisting of six sides as well as the column. It is seldom very fine, though it keeps regularly to its shape, and the plane

planes are a little glossy. It is of a dusky white, very soft, and is found in the mines of *Cornwal* and *Devonshire*.

SPAR with a very short pyramid consisting of six sides as well as the column, is generally very pure and clear, though sometimes blemished, and the common size is about an inch and a half. It is naturally of a greyish white, very transparent, and pretty bright; however, it is sometimes tinged with other colours. It is very soft, and found in the mines of *Derbyshire*.

SPAR with a very long pyramid consisting of five sides as well as the column. It always adheres to some solid body, and is of a clear fine texture. It is seldom more than a quarter of an inch thick, and the third part of its length high. It appears very smooth and glossy, and looks like Crystal, though it is sometimes tinged with other colours. It is pretty hard, and is found in *Mendip* hills.

SPAR with a thick column, and a very short and large pyramid, consisting of five sides, as well as the column; it is very coarse and foul, and seldom above an inch and a half long, and then the column is an inch thick. The planes are pretty smooth, though it is very soft; it is found in *Hartz* forest.

SPAR with a broad depressed pyramid, is usually very fine and clear, though not always; for it is sometimes variegated with small specks of yellow, green, and other colours; it has a short column with six sides, and the pyramid is terminated with as many. There are ridges on the planes of the column that hang over each other like the tiles of a house; when pure, it is entirely without colour, is pretty hard, and is met with in *Hartz* forest.

Slender SPAR with a long blunt pyramid with three sides, and the column has the same. This is very common, it has a coarse impure texture, and is of an opaque dusky colour; but sometimes it is tinged with other colours, as white, yellow, reddish, blueish-grey, or pale-brown; it is likewise frequently tinged with the colours of gems, and is sometimes not above the sixth part of an inch, and at others two inches long.

It

It is found in prodigious clusters. Whatever its colour is, it may be easily known by its shape; it is pretty hard, and is found in most parts of the world.

Short SPAR with pointed pyramids having three sides, and a column with the same, is found from the twelfth part of an inch to two inches long, and is commonly whitish; but when pure, it is entirely colourless, transparent and bright; it is very soft, and found in many parts of *England*.

Thick SPAR with a long pyramid having three sides, and a column of the same. This is sometimes fine, and sometimes blemished with reddish clouds; it is of various sizes, but commonly half an inch in length, of which the pyramid is one half; it is pretty hard, and is found in the clefts of stones in *Northamptonshire*.

SPAR with a very short column having three sides, and a long blunt pyramid with the same. This is commonly coarse, impure and dusky, with very little brightness and less transparence. It is very soft, and is found in *Derbyshire* and *Somersetshire*.

SPAR without a column, being only a pyramid with six sides that adheres to some solid body, has the appearance of Crystal, and is short and blunt with smooth planes. It is pretty hard, and is hitherto found only in *Saxony*.

SPAR without a column, being only a pyramid with six sides and a narrow base, by which it adheres to some solid body, is sometimes pretty pure, and sometimes foul and coarse; some are no longer than a barley corn, and others near an inch in length. It is considerably hard, and is found in *Hartz* forest.

SPAR without a column, being only a pyramid having six sides, and fixed to some solid body, is often foul and coarse, and tinged with different colours. It is found from an eighth of an inch to half an inch in length, and is very bright, though but little transparent, and is found in *Northamptonshire*.

Long SPAR, which is only a pyramid with three sides and a narrow base, is of a very coarse texture, and often stained with different colours; but is most commonly of a dusky brown, and is found from
the

the tenth part of an inch to an inch in length. It is pretty hard, and is found in *Germany*.

Hard transparent SPAR of the shape of a parallelepiped, commonly called *Iceland Crystal*, is extremely pure, clear and fine, and is found of various sizes from a quarter of an inch to three inches in diameter; but its usual size is two inches and a half. It seems to be smooth and even at first sight, though if nicely examined ridges will be found upon it; it is almost as transparent as fine Crystal, but is very soft, and generally found single. It is found in *Iceland*, as also in *Germany* and *France*; it consists of plates laid one upon another, and will cleave in the manner of Talc; and when it is reduced to powder it still retains its rhomboidal figure which may be discovered by a microscope. It has this singular property, that all objects appear double through it, which is owing to the double refraction of the rays of light.

Dull, Soft, Whitish SPAR in the shape of a parallelepiped, is somewhat like the former, and has the same double refraction; yet is not so pure or bright; it is commonly about an inch and a half in length, and an inch and one third in breadth, and is much softer than the former kind. It is found in *France*, *Germany*, and *England*.

Soft, Whitish, very Bright SPAR in the shape of a parallelepiped, is not so transparent as the former, though it is like it in shape; but the texture is very impure; it is commonly about an inch long, three quarters of an inch broad, and half an inch thick; and is sometimes of all the colours of gems, and splits like Talc. It is found in the lead mines of *Yorkshire*.

Dull, Hard, Pale-Brown SPAR in the shape of a parallelepiped, is very coarse and foul, and is of the same form with the preceeding; it is found from the size of a large pin's head to that of an inch in length, and consists of parallel plates, though it does not split even. It is the hardest of all of this kind, and is found in the lead mines of *Yorkshire*.

White, Bright, Shattery SPAR, is of no determinate shape, though its texture is pretty pure and equal;

equal; it is of various sizes, from an inch to ten or more in diameter; it consists of flakes running both ways, and is sometimes tinged with different colours, as blue, green, red, or faint purple; but it is most commonly of a fine deep brown, and is found in the lead mines of *Derbyshire* and *Yorkshire*, and more particularly in *Wales*.

Milk-White Opaque Shattery SPAR, has a pretty fine and perfectly equal texture; but has no determinate shape, and is found from an inch to a foot in diameter, with a rough irregular ragged surface; it is sometimes a little brownish, and sometimes inclining to a dusky red, and is pretty hard. It is found in *France* and *Germany*, and in some of the cliffs of the *Welsh* coasts, as well as in *Yorkshire* and *Scotland*.

Hard, Dull, Snow-White SPAR, is of a coarse, impure, unequal texture, but has no regular form, and the surface is always rough and irregular. 'Tis from one twentieth of an inch to half an inch in diameter, and is considerably hard. It is found in *Derbyshire*, *Yorkshire* and *Cumberland*.

Hard, Grey, Transparent SPAR, is of a pure equal texture, and has the appearance of Crystal, though it is sometimes tinged with the colour of gems. It has usually the figure of common flints with very uneven surfaces; and the size is from two inches to six or eight in diameter; it is frequently tinged with green and sometimes with yellow. It is pretty hard, and is found in the lead mines of *Scotland*, and in other places.

Transparent, Colourless, Shattery SPAR, is nearly like Crystal, and is of a pure, fine, regular texture; but it has no determinate figure, being found of various shapes and sizes, that is, from half an inch to five inches in diameter; it is dark on the outside, but when broken, extremely bright and glossy, and with a small blow it will fall into many rhomboidal thick masses. It is not very hard, and is found in *Hartz* forest.



C H A P. XV.

Of Crustated S P A R S debased with Earth.

HA R D, Semi-Transparent, Yellowish-Brown SPAR, has an equal regular texture, though not very fine, and the earth is regularly diffused throughout. It always conforms to the shape of the substance to which it is joined, and consists of a thin crust extended over flat, round, and irregular surfaces. It is from the twentieth part, to the third part of an inch thick, and is from a few inches, to many feet in breadth. It is very soft, and is found in many parts of *England*.

Brittle, Transparent, Whitish SPAR, is of a pretty pure fine texture, tho' sometimes transversely streaked with earth, rendering it red, yellow, brown or black; it is always found in the form of a crust, and the surface is sometimes flat for many feet together. It is found on the sides of the perpendicular clefts of the mines in *Germany*, and the caverns of *Mendip* hills.

Hard, Whitish-Brown, Dusky SPAR, is foul and impure, though of a regular texture: it is extended over various bodies in the form of a crust, and is from an inch and a half broad to five or six feet. It is pretty hard, and is found in *Hartz* forest, as well as in the lead mines on *Mendip* hills.

Dull, Crumbly, Whitish SPAR, is very impure, opaque, irregular, and of a somewhat coarse texture; and is always found in the form of a pretty thick crust. It is sometimes very large, extending often three or four feet each way over the even sides of the fissures of the strata of stone. It is often cracked, and sometimes broken in several pieces, leaving cavities that are usually filled with a loose marly earth of different colours. Sometimes the earth is found in a lump, but oftener in powder, with which the cavities are but half filled up; it is of a rough surface, and when broken, of an irregular texture. It is very soft
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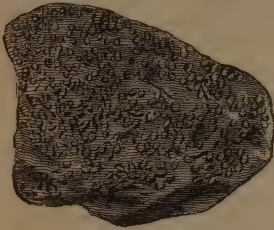
Cluster of Spar.



Strombites 303.



Stalactites 355



Conchites



and crumbly, and is found in *Mendip* hills in *Somersetshire*, as well as in a large cavern near *Wales*.

Dull Pale-Brown, Brittle, Coarse SPAR, is the most common of all the crustaceous Spars, and is very coarse, impure and earthy, being often tinged with various colours, by the different earths it is blended with. It is of no certain size, and it conforms to the shape of the mass to which it gives a coat. It has a pretty even surface, the wrinkles being never deep; and, when broken, it is of an irregular texture. It will readily crumble between the fingers, and is found as well on the inside of pipes for water, as in tea kettles.

Hard Brownish-White Earthy SPAR, is of a very coarse texture, and resembles a very loose stone. It is found in crusts of large extent, on the roofs and sides of subterraneous caverns, and sometimes it bestows a coat on sticks and stones. It has a wrinkled surface, and has a very loose texture. It is pretty hard, though it will not bear a blow without crumbling to pieces.

Hard Whitish Earthy SPAR, with thin crusts, and a smooth surface, is of a dull opaque colour, and of a foul, coarse, impure texture, having the appearance of a coarse stone, with a large soft grit. It is found on the surfaces of stones, though it is sometimes full of tubercles, being formed into large clusters of great roundish balls of various sizes. It is pretty hard, and is found in *Hartz* forest, as well as in some parts of *England*.

Hard Pale-Brown Earthy SPAR, with numerous very thin crusts, is the hardest of all of this kind, tho' it is of an impure, coarse and foul texture. It is found on various bodies, and consequently must be of various shapes, and sometimes it will petrify small sticks and bits of wood. It is remarkably hard, and is found in many parts of *England*.

White, Light, Brittle, Earthy SPAR, is the coarsest of any of this kind, and the whole mass is light, loose and brittle; for some of this kind will not bear touching without crumbling to pieces. It has very luxuriant efflorescences on its surface, and more
than

than any of these bodies. It is met with in various places.

Light, Hard, Pale-Brown, Earthy SPAR, with a smooth surface. It often incrusts round moss, for which reason some have taken it for petrified moss. It is of an equal uniform structure, but foul, and always assumes the shape of the body it is formed upon. It is pretty hard for an earthy Spar, and is found in all parts of the world.

Whitish, Brittle, Crustaceous Earthy SPAR, with a rough surface, is of a very coarse, foul, impure texture, and of an earthy colour. It is always of the shape of the thing it incrusts, being sometimes met with on small stones, branches of moss, and the like. It is of a dull whitish colour, without the least brightness, and is very soft and brittle. It is found in the subterraneous caves of various countries.

Brownish-White, Brittle, Earthy SPAR, with a dirty surface, looks like a loose, crumbly stone, and has a very coarse unequal texture. It is found on moss, and in the same places as the former, particularly in *Ireland*, on the borders of springs, and the bottoms of rocks.

Greyish-White, Brittle, Opaque, Earthy SPAR, is coarse and impure, and covers sticks, straws, and many other bodies in such a manner, as there is no guessing what is contained therein. It has not the least brightness, and it will easily break between the fingers. It is found in almost all parts of the world.

Smooth, Brittle, Whitish-Brown, Earthy SPAR, is very impure, coarse and foul, having the appearance of marly earth. It is, partly, in the shape of long cylindrick pipes, and some times incrusts vegetable substances. The pipes are of various sizes, but seldom less than the barril of a crow quill, or greater than than a man's finger. The surface is pretty smooth, but not glossy, and it is remarkably light and brittle. It is found in the marl pits of *Derbyshire*; and in the petrifying spring in *Northamptonshire*.

Hard, Pale-Brown, Thick, Rough, Earthy SPAR, which is the osteocolla of the shops, is of a very coarse, foul and impure texture, having the appearance

ance of hardened marl. It is always found in long, thick, irregular, cylindrical pieces, usually hollow, and sometimes filled up with a softer substance. The surface is always rough and deeply wrinkled, being without the least brightness. It is very hard, and is found in many parts of *Germany*. It has formerly been much esteemed as a medicine, though it is now out of use.

Whitish-Grey, Brittle, Earthy SPAR, with a smooth surface, by some called the *Fossile Unicorn*, and by others *Stone Marl*. It is of a stony substance, and in colour, smoothness, and form, represents the horns, teeth or bones of animals; but sometimes it is softer, with a hard yellowish blackish, or ash coloured crust, while it is soft and brittle in the inside. This has an astringent taste, and adheres firmly to the tongue. It is frequently dug up in pieces resembling bones that are petrified; among which are the teeth called grinders and incisors, which are extremely large, to which there is a root plainly connected. Sometimes they look like the fragment of bones of the arms and legs; and sometimes they appear like the branches and trunks of trees turned into stone. They are found in various parts of *Germany*, as also in a hill near *Paris*, where they appeared to be real bones, covered over with a stony substance. It is commended by the *Germans* for being an astringent, promoting sweat, and for stopping bleedings and loosenesses. It is given in the epilepsy from half a scruple to a drachm.

Whitish-Brown, Tuberosc, Unequal SPAR, in the shape of coral, is of a pretty fine texture, and contains less earth than others of this kind. It is commonly in the shape of a small oblong cylinder with a pretty even surface, though it has often several branches like the coarser white fossile corals. It is about two inches and a half long, and the third of an inch in diameter; when broken, it is firm, solid and compact. It is found lodged in the strata of yellow clay, and is very common in *France* and *Germany*; it is also met with near *London*.

Hard,

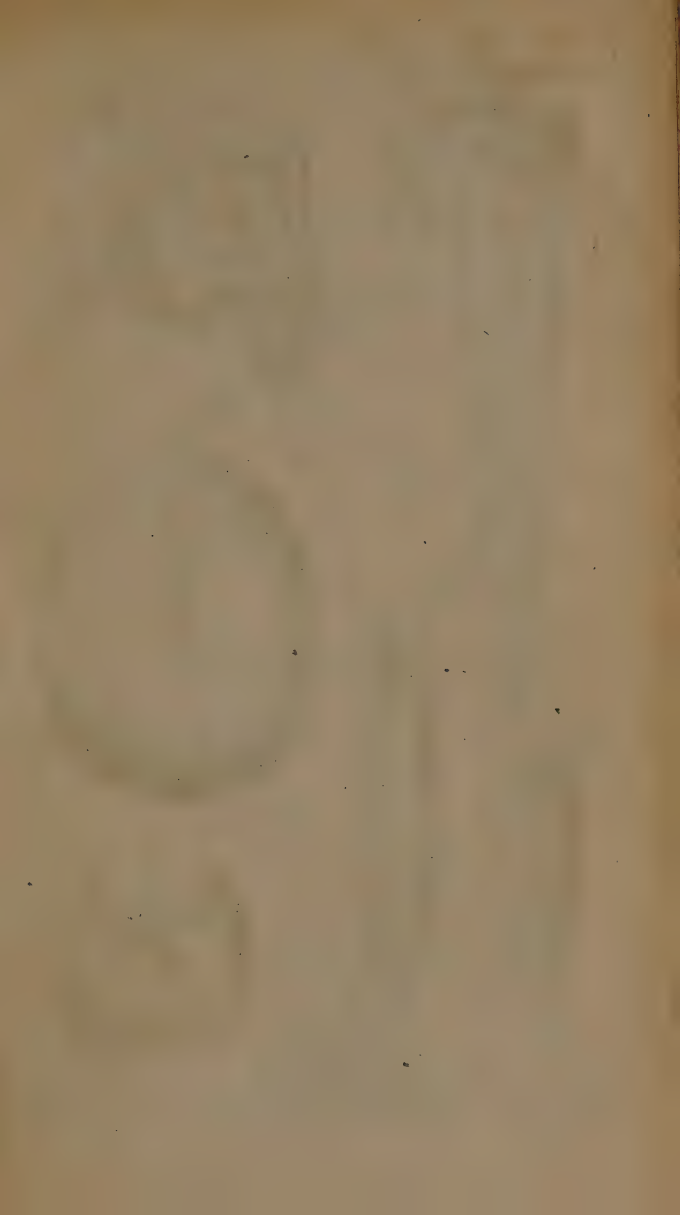
Hard, White, Oblong, Conical SPAR, is extremely pure, and is as crystalline as any Spar whatever. It has the appearance of an icicle, broad at the base, and tapering towards the point; and its natural place is the arched roof of a subterraneous cavern. It is found from an inch to fifteen inches in length, and is sometimes perfectly round. These Spars are formed by water dropping from the roof of these caverns; and consequently it is often met with in a petrified state on the ground formed into various shapes; we have a remarkable instance of this in *Pool's-Hole* in *Derbyshire*, which is counted one of the wonders of the *Peak*.

White Shattery SPAR in the shape of a cylinder, is also found on the floors and sides of caverns, and in strong icicles hanging from the top; it is of various sizes from two inches to twenty in length, and seems to be very little different from the former, only sometimes it is a little yellowish, and sometimes of a blueish grey; it is likewise more brittle than the former.

Yellow Shattery Crystalline SPAR in the form of a cylinder; it is of various sizes, from two to twelve inches long, and is in the same shape as the former, being found hanging from the roofs of mines and subterranean caverns.

Brownish, Brittle, Earthly SPAR of an oblong shape is not so much like Crystal as the former sorts. It is always very long and slender, as well as hollow, and consists of very numerous thin crusts. This also hangs on the roofs of caverns, and terminates in a sharp point; it is sometimes, though seldom, two or three feet long, and is easily broken. The surface is a little rough. It is also met with at the bottoms of the same caverns.

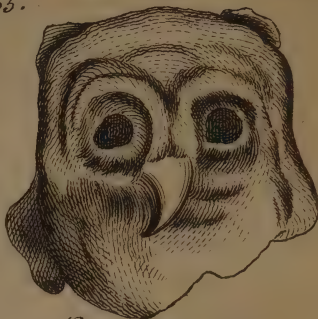
Snow White, Brittle, Oblong, Earthly SPAR is of an irregular texture, and it appears every where to the naked eye of a snow white colour; it hangs to the roof of the place where it is formed by a small base, and is sometimes four or five feet long, while the thickest part is not more than three quarters of an inch in diameter. It has a very glossy surface, and when broken, appears to be composed of a great many thin



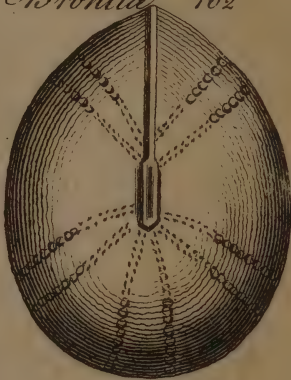
Stalactites or Icicle Spar
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Owls Head Stone 315



Brontia 162



Belemnites
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Belemnites
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thin crusts. It is found hanging down from the arched roofs of old mines in *Hartz* forest; as also in an arched brick vault which supports part of the terrace at *Windsor* castle. It is plain that the origin of these is owing to water saturated with Spar.

White SPAR, in the form of a ball, composed of numerous crusts with a thin surface; it is of a considerably pure and fine texture, with a bright surface in the shape of a perfectly round ball, and when broken, the parts are pretty transparent. It is found in some of the caverns in *Hartz* forest.

Greyish White SPAR of a round form, consisting of thick crusts and a rough surface, is not so pure as the former, though of the same shape, only sometime it is a little more oval and flat; it is from the size of a hazel-nut, to that of a wall-nut, and is found loose in the rills of water in caverns; this also is found in the caverns of *Hartz* forest, as well as in some of our *Devonshire* mines.

Yellow Thin crusted SPAR of a round shape with a prickly surface, has a very pure and fine texture, and though sometimes it is as round as a ball, it is found in others a little oblong; it is not much larger than a nutmeg, and is commonly of a pale yellow, but sometimes tinged with brown, or a faintish red. It is found in the springs that run across the cavern, called the *Devil's-Arse* in *Derbyshire*.

Small Brownish White Oval SPAR with a smooth coat, has been mistaken for a common stone; the texture is tolerably pure, and is sometimes as round as a ball; but more commonly a little oval. The largest do not exceed the size of a tare, and many of them are less than a grain of sand. It is found in plenty in the mines of *Saxony*, as well as in *Derbyshire* and *Yorkshire*.

Small Brownish White Round SPAR is never found single, but always in vast quantities together; it is of a coarse texture, and appears rather like coarse stone than Spar. It is found in the tin mines of *Cornwall*.

CrySTALLINE SPAR, without any colour, consisting of thin flakes, is found in various sizes, from the tenth part of an inch to two inches in diameter. It is ex-

tremely pure, though sometimes tinged with the particles of metals, and rendered of the colour of gems. It is extremely bright and transparent, and might be taken for a gem, till tried. It is very soft, and is found in some of our lead mines in *Yorkshire*.

Milky CrySTALLINE SPAR, with a thick crust, is of a pretty fine pure texture, and of various sizes, though commonly about the third of an inch in diameter. The surface is bright and glossy, and is sometimes tinged with metallic particles, being often found of a green and yellow colour. It is met with in the lead mines of *England*.

Pyramidal Whitish-Brown Dull SPAR, consisting of four sides, owing its figure to tin, is neither bright nor transparent. The texture is foul and coarse, and it has a broad bottom with a blunt point. The size is from one tenth of an inch, to one inch in length, and it always adheres to some solid body; the surface is pretty smooth, and a little glossy, with a brown metalline tinge. It is common in the mines of *Devonshire* and *Cornwall*.

White Thin SPAR of a rhomboidal form, consisting of six sides. This owes its shape to iron ore, and is pretty fine, pure and equal in its texture; it is of various sizes from the twelfth part of an inch to an inch long, and is moderately bright and transparent, but very soft. It is found in the forest of dean in *Derbyshire*.

Whitish Brown Thick SPAR of a rhomboidal form with thick crust, is not so pure as the former, it being blemished with clouds and flaky flaws. Its size is from that of a barley corn to two inches long. It is found in the forest of *Dean*.



CH A P. XV.

Of S A L T S.

FOSSILE SALT, commonly called *Salt Gem*, is of several kinds; it is almost as transparent as Crystal, and is sometimes as white as snow, at others grey, red

red or yellow. When dissolved in water and crystallized, by evaporating the moisture, it becomes of a perfect cubical shape. It is called Sal-Gem, because it has some resemblance to stones of that kind ; but it may be readily distinguished from them, by applying it to the tongue. There are large rocks of this kind in different parts of the world, particularly in *Spain* near the river *Ebro*, and there is of a purple colour in *Portugal*, and in *Poland* and *Russia* there are several. It is pretended in *Spain*, that it grows as fast as it is taken away ; however, it is certain, the mine has been opened five hundred years. In *Poland*, six miles from *Cracow*, they hew the Salt out of the mountain, in the same manner as they do stone, in very large pieces. It has the same virtues as common Salt, and is used as well for glysters as suppositories to evacuate the hard excrements. But this must never be used where there is an inflammation of the intestines.

Common SALT is either made with sea-water, salt springs, or wells, by the heat of the sun, or by boiling. In some places they dig pits near the sea, and line them with clay ; they afterwards fill them with sea-water at high tides, and the water being exhaled by the heat of the sun, there is left plenty of Salt at the bottom. In *Neustria*, that is, in the western parts of *France*, they heap up the sand on the sea-shore, on which they pour sea-water often, and after the moisture has been exhaled by the heat of the sun, the Salt is left behind. When there is a sufficient quantity, they boil it in fresh water, and then strain it off into leaden vessels, when they boil it again till it is become of a proper thickness ; after which they remove the fire, and suffer it to coagulate into whitish crystals of Salt. They make Salt from salt springs much in the same manner, though there is a particular art in causing it to granulate ; for some mix bullocks blood therewith, to cause a quicker separation of the Salt from the bittern. This likewise frees it from the bituminous and earthy particles mixed with the Salt, which are either carried off in froth, or remain in the bottom of the pans. But that is the best Salt which is made with lakes of sea-water, by the heat of the

sun; because that which is made by fire has generally somewhat of bitterness. That made with the water of salt springs or wells is most pungent, on account of the alkalious mineral Salt mixed therewith; and is more apt to dissolve than the former, even with a moist air; therefore that made with sea water by the heat of the sun is more fit for medicinal purposes; and is commonly called *Bay Salt*. This Salt also, when dissolved and crystalized, is of a cubical form; but that made either with salt springs, or sea-water, by the assistance of fire, cannot be brought into exact cubes, on account of its mixture with other Salts. Bay Salt dissolved in water, which being evaporated till a cuticle appears, will shoot to cubical crystals when cold; but that which is left being of an alkaline nature, cannot be crystalized into any regular figure; however, there is a Salt made therewith, which is now generally known by the name of *Epsom Salt*. The spirit of Salt, when mixed with an alkaline Salt, as long as they will ferment together, will turn to common Salt, which in its taste, and its cubical shape, resembles Bay Salt; whence it appears that sea Salt is an acid perfectly saturated with an alkaline Salt. The use of sea Salt is well known for its preventing flesh from putrefaction; and therefore is necessary to hinder the fermentation of victuals, and their corruption; it likewise restrains the heat of the fluids in the body. Besides when volatile urinous salts are mixed with it, it turns into a Sal-Ammoniack, which is proper to temperate the sharpness of the humours, and to cleanse them by urine. Add to this, that the pointed particles of Salt by stimulating the solids, render the oscillations of the fibres more lively; whence the functions of the body are better performed. It is given inwardly in the difficult digestion of aliments, in want of appetite, and in obstructions of the belly and kidneys; however, as its use is very common, it is seldom taken internally as a medicine. People are in doubt whether it prevents or breeds stones in the kidneys; for many affirm, that the latter is true; but then it must be understood
of

of meats that are rendered hard by being over-salted. The spirit of Salt is proper to promote urine, to prevent the stone, to cure the dropsy, and to quench thirst in burning fevers. It is excellent against the scurvy, and is given from three drops to twenty or upwards; or as much as will make any liquor agreeably acid. Dulcified spirit of Salt is given from fifteen to twenty drops every morning, in a decoction of juniper berries.

NATRUM or NITRUM of the ancients, is vastly different from the *Nitre* of the moderns. By old authors it is said to be an acrid Salt of an alkalious nature, brought from *Egypt* and other places, which would ferment with acid liquors, and was used for washing of cloaths and for making glasses. *Natrum* is now found in *Lesser-Asia*, in little hillocks, like mole-hills, in the spring and summer, of which they make a lye for washing their linen; likewise they make soap therewith, as *Tournefort* affirms. It is at present seldom seen in *Europe*, though it was of frequent use with the ancients, not only for medicine, but various other purposes. The natrum of the ancients was a native Salt of a whitish colour and a bitterish taste, which did not crackle in the fire like common Salt, nor flash like Saltpetre; but it would melt and swell like allum and borax, as well as ferment with acids; whence it appears to be much of the same nature as pot-ashes.

NITRE of the moderns, commonly called SALT-PETRE, is a white crystalline substance, of an acrid bitterish taste, and seemingly a little cold. Its crystals are in the shape of prisms, with six sides, which are slender, long, equally thick, and terminate at each end, like a pyramid with a point. It dissolves readily in water, melts over the fire, and will not flash, unless mixed with sulphur or charcoal; and then it will with great violence. *Saltpetre* is often seen on old walls that are not washed by the rain; from whence it is taken off with brushes. *Artificial Saltpetre* is made with earth saturated with common or pigeons dung, whose salts will, in time be converted into Saltpetre. As Saltpetre cannot be obtained, except from earth impregnated with urinous, animal, or ve-

getable Salt, some are in doubt whether it is a mineral or animal production; but it is generally reckoned among those that are mineral, because it may be extracted immediately from the earth, and not from any excrements themselves, unless they be mixed with earth.

The method of obtaining *Saltpetre* is, by chusing an earth that has the taste of nitre, and abounds with it; this must be washed in a sufficient quantity of water, till the water is rich therewith; and then it is to be strained and boiled till it comes to a due consistence; after this it is to be poured into broad tubs while it is hot, and remain there till it is almost cold. In the mean while the sea Salt wherewith nitre always abounds, will fall to the bottom; after which the nitrous liquor is to be poured off, and the sea salt left behind; then it is to be put into other tubs in a cold place, till the crystals shoot. These are to be taken out, and the remaining water is to be set over the fire again, to evaporate part of it; this must afterwards be exposed to the cold, that the remaining nitre may shoot into crystals. When no more can be obtained, there will remain a sharp bitter water, which, to the touch, feels like oil, and is called the mother of nitre; because when this is sprinkled on the ground it will dispose the earth to yield more nitre. All these crystals are to be dissolved in fresh water, and the same process is to be repeated over again, that the nitre may become more pure. Sometimes the workmen, after the nitre is purified, will put it into an iron pot, and melt it over a strong fire till all the moisture is exhaled, and then they suffer it to concrete into a solid mass, which they call rock *Saltpetre*. *Saltpetre* thus refined will melt over the fire without any noise; but being mixed with charcoal it will emit a bright flame, and leave a little fixed Salt behind. If it should crackle in the fire it is a sign it was not cleansed from sea Salt. The spirit of nitre will dissolve silver, whence it is called *aqua fortis*; and it will communicate the same power to spirit of vitriol and spirit of sulphur. However, *aqua fortis* will

will not dissolve gold ; for that is only to be done with aqua regia.

NITRE is used in medicine to cool the blood, and to restrain the heat of a fever, to allay thirst, and to hinder putrifaction ; for which reason it is commended in malignant cases. It is given from three grains to a scruple, three or four times a day. A drachm given every morning, dissolved in a draught of ale, has been found to cure the dropsy. *Stahl* affirms, that it is good in fits of the gout, and more especially when it attacks the stomach ; and also in hæmorrhages, and especially spitting of blood, though it is not proper in a consumption. When Nitre is put in a crucible and placed over the fire, it will melt like water ; and then, if powdered charcoal be thrown into it, it will deflagrate with a noise, which being over more powder must be thrown in, and this must be repeated till the Nitre will flame no longer. By this method the Nitre will turn into an alkalious salt, which has the same virtue as salt of tartar. Every one knows that Nitre mixed with due proportions of sulphur and charcoal will make gun-powder.

VITRIOL is either native or factitious ; and with regard to the colour, is distinguished into white, blue and green. White Vitriol is brought from *Germany* in large lumps, which look almost like loaf sugar, and has a sweetish astringent taste. It is found in mines at *Goslaer* in *Saxony*, where it springs forth from the sides, under the appearance of a woolly substance, which being dissolved in water, must be boiled to a due thickness ; and, at last, it will turn into a white mass like sugar. Sometimes there are found in the same mines pieces of Vitriol which are already crystallized, and appear transparent.

Blue VITRIOL is dry to the touch, and is formed into blue crystals, like sapphires, of a rhomboidal form, but flat, and with ten sides. It is prepared in various places, but more particularly in *Cyprus* and *Hungary* ; whence it is commonly called *Hungarian* and *Cyprian* Vitriol. It obtains its fine colour from copper, and has an austere taste, with great sharpness.

Green VITRIOL is of an herbaceous colour, and has various names, according to the different places from whence it is got. It abounds with iron, from whence it has its colour, and is either in large crystals of a rhomboidal form, or in bits composed of crystalline grains united together, which feel a little oily to the touch; it has a sharp styptick taste.

VITRIOL is nothing else but an acid vitriolick salt, which by corroding zinc, copper, or iron, coagulates with them, and so concretes into a transparent body, which takes its colour from the metal. In the days of *Galen* blue Vitriol was obtained from a vitriolick water, exhaled in the heat of the sun; but now it is got in *Hungary* from water in the copper mines, near *Smolnik* and *Newsol*, by evaporation; and green Vitriol is obtained in *Germany* after the same manner. But in *England*, at *Deptford*, near *London*, green Vitriol is obtained from a stone, called Purites, which is heavy and brown on the outside; and, when broken, there are rays that appear to run from the center to the circumference; and consist of particles that shine like brass, and yet are without any taste. These stones, after they have been exposed to the air for some time, undergo a sort of fermentation, and then crack into clefts, out of which a kind of white down of a saltish nature springs forth, which has an acid styptick taste; at length the whole substance dissolves, and turns into a fine saltish powder, of a vitriolick taste and sulphurous smell. If these stones are calcined in the fire, a copious smoke will exhale from them, with a sulphureous smell, and a red calx will remain behind, containing a little iron and copper. The common method is to lay these stones in a large yard, to the height of about three feet, in the open air, for three years together, turning them every month, that the heat of the sun may have the greater effect upon them, and the rain water macerate them better; by this means they are converted into a vitriolick earth. The rain water that washes them is always conveyed by pipes into a cistern, and there kept; and then it is put into a large leaden vessel, and boiled to a proper consistence, bits of old iron
being

being first thrown therein, which are soon dissolved in the lye; then it is poured into another leaden vessel to cool, where there are wooden poles to which the vitriol will adhere and form itself into small lumps. This is generally known in *England* by the name of copperas.

White VITRIOL is extremely good for making an eye-water, which is, perhaps, the best hitherto known for abating inflammations of the eyes, and to repel fluxions thereon. It is made by dissolving a scruple of vitriol in hot rose water, and then passing it through a linnen cloth. A few drops of this are to be put into the eyes. When blue vitriol is calcined, it is very proper for stopping hæmorrhages, by cauterizing the vessels, and condensing the blood therein. Spirit of Vitriol, like other acid spirits restrains the heat of the humours, stop hæmorrhages, and promote urine.

ALLUM is either native or factitious; but the former sort is now little or not at all known. The factitious is distinguished by the name of the country it comes from, it being of several kinds; for there is scarce a country in which it is not made. One sort is called Roch, or Rock Allum, because it is sometimes got out of a rock, where it is often met with in very large pieces. The ancients were entirely ignorant of the method of making Allum, though the native was of great use among them. However, we are not certain what that was. *Tournefort* met with some in the island of *Milo* in the *Archipelago*, which he calls *Schistum*, that had an earthy astringent taste, and was of an ash colour, with several hairy whitish excrescences; it had also a smell like aqua fortis, but very faint. He also found another sort which he calls *Trichites*, this was divided into pieces of the thickness and length of a man's finger; and the ends were cloven into hairs of a hoary colour, looking almost like feathers or pencils. It would dissolve in water, melt in fire, and had an astringent taste. This, from its shape, has been called by some Plumous Allum.

There are different manners of making Allum in different countries; at *Puteoli* in *Italy*, in a field called *Solfatara*, there is an Allum that springs spontaneously out of the earth, this they every day sweep together with brooms, and throw it into pits full of water, till it will dissolve no more, and there they leave it, till the subterranean heat has exhaled the greatest part of the moisture. At length the lye is poured into wooden vessels to cool and crystalize, and the crystals, which are white and transparent, are dried and kept for use. Besides, in the hills near the same place, they get out stones from which they extract Allum, in the same manner as they do in the Allum pits thirty miles from *Rome*, which are called the *Alumiere della Tolfa*. Here they get Allum out of a very hard stone, hewn out of a rock; which, when broken, is put into lime-kilns, and burnt like lime for the space of twelve or fourteen hours at most; when cool, and it is carried in carts into very large areas, and laid in flattish heaps, between which are ditches full of water. They sprinkle the calcined stones with water three or four times a day, for forty days together; and, at length, after fermentation, they are covered with a reddish efflorescence. When the lime is thus prepared, they throw it into a cauldron full of water, and boil it for some time, stirring it continually, till the saline substance of the stone is dissolved. Then they take the aluminous liquor and separate it from the useless earth; after which they boil it again to a certain degree of thickness; and then let out the hot lye into aqueducts made for that purpose, which convey it into coolers of oak-wood; and there, in eight days time, it concretes into Allum, sticking to the sides of the coolers four or five inches thick; that is, into transparent crystals of a palish red colour.

In *Yorkshire* and *Lancashire* they get their Allum out of a blueish stone, like slate, that is full of sulphur. It is a sort of Pyrites, which will kindle in the fire, and being exposed to the open air will break of itself. The fragments of these stones are laid in heaps, where they are

are burnt in the open air; and when the sulphur is quite exhausted, the fire will go out of itself, after which they steep the calcined stones for twenty-four hours in water, when it is drawn off into leaden cauldrons with the lye made with the ashes of a sea-weed. After the liquor begins to boil, they pour urine therein, which causes the sulphur, vitriol, and earthy matter to sink to the bottom. This done they take the liquor and pour it into vessels made with deal boards, where, in time, the Allum concretes to the sides, in white transparent crystals, which, after washing, are melted in iron cauldrons, after this it is poured into a tub, and forms a mass of the same size.

In *Swisserland* they get Allum, vitriol, and sulphur out of the same stone, which is an elegant Pyrites. This is heavy, exceeding hard, and seems to be full of gold and silver specks; they make it hot in the fire, and then sprinkle it with cold water, by which method it will break to pieces. Then they pound it, and putting it into proper vessels they place them in a reverberatory furnace, in order for distillation. By force of the fire the sulphur in the stones is melted, and runs out into a vessel full of water; when this is done, they expose the remainder in the open air, where it remains for two years, when it becomes very hot, and emits smoke with a faintish flame, that in the day-time can hardly be perceived. After it has burnt thus there remain blueish ashes, from which, by the help of washing, evaporation, and crystalization, they extract vitriol. This done, there still remains, after the crystalization of the vitriol, a thick, fat fluid, which, with an eighth part of urine, and lye of wood-ashes are set to boil, and then it deposits a thick, red, plentiful sediment. Thus the liquor being cleansed, they cause it to boil to a proper thickness, and set it in a cool place to crystalize; and so they obtain the *Swisserland* Allum.

Allum is of a very binding nature, and has always been looked upon as a great styptick. That of the ancients had a smell like aqua-fortis, but the factitious has none at all; and when placed over the fire in an iron pan it bubbles up and melts like water. When
Allum

Allum is set to cryſtalize it concretes into a figure with eight ſides, which looks like a triangular pyramid, with the angles cut off; inſomuch that it is composed of four hexagon ſurfaces, and four that are triangular. From a chymical analyſis it appears, that Allum conſiſts of an acid vitriolic ſalt, and an aſtringent earth or bole intimately united. Allum is recommended for ſwellings of the gums, and againſt the fluxions upon the tonſils. When burnt it will take down proud fleſh in wounds and ulcers; it is of no uſe internally, only it is ſometimes given with a large proportion of nutmeg for the cure of the ague.

SAL-AMMONIAC of the ancients, was a ſort of foſſile Salt or Sal-gem, though *Dioſcorides* would have it to be a kind of common Salt, which is denſe, transparent, white, eaſily cloven, and dug out of the earth; all which have the properties of Sal-Gem, for it will readily cleave into plates. *Pliny* takes notice of another kind of Sal-Ammoniac, which was found among the ſand in the *Cyrenean* deſart, and was like that, which they called *Schiſton*, being in long pieces, but not transparent. But whatever this was, it is certain, that made uſe of now, is always factitious. However, there is one that may be called native, which is got out of the rocks near *Puteoli* in *Italy*, where the earth emits ſmoke and flames. The inhabitants lay heaps of ſtones over the clefts, which catch as it were the ſaline ſmoke, that after a few days condenſes into a white cruſt, which being brushed off, is called Sal-Ammoniac; but this is like ſea Salt.

Factitious SAL-AMMONIAC, is of two ſorts, one of which is brought from the *East Indies* in conical pieces like ſugar loaves, of an aſh-colour; but this is very ſcarce. The other and common ſort is brought from *Egypt* and *Syria* in flat cakes, convex on the upper part with a ſort of a navel, and a little hollow on the other; they are about a palm in breadth, and three or four inches thick, of an aſh-colour without, and whitish within. Some have pretended that this Salt proceeds from the urine of camels, dried in the ſands of the deſerts of *Lybia*. Others ſuppoſe, that
it

it is made of the urine of camels or cattle dried over the fire, and then washed, and afterwards made into cakes. But the truth is, it is composed at *Damietta* in *Egypt*, from a kind of foot in large glass vessels a foot and a half in diameter, and is mixed with sea Salt, moistened with the urine of cattle or camels. They fill the vessel to two thirds, of which there are twenty or thirty in the same furnace, whose sides are so covered with bricks and clay, that the neck of the vessel is only six inches above them. Then they light a fire in the furnace, which is gradually increased till it is very strong, which is continued for three days and nights; by which means the salt is sublimed to the upper parts of the vessels. All kinds of foot are not proper for this purpose, but that only which proceeds from fires made with cattle or camel's dung, and is always carefully collected for this purpose. The reason why they have many fires of this kind in *Egypt*, is, on account of the scarcity of wood.

SAL-AMMONIAC is a very useful medicine, for it dissolves thick clammy humours, and carries them off by sweat and urine. Some commend it in agues, given to the quantity of half a drachm, with a scruple of crabs eyes before the fit. The Volatile Salt and spirit of Sal-Ammoniac are good in a lethargy, apoplexy, fainting, giddiness of the head, and hysteric fits, being held to the nose. Internally, the spirit promotes a diaphoresis, sweat and urine; it blunts acid humours in the body, promotes the circulation of the blood, refreshes the spirits, excites the oscillations of the nerves, and opens obstructions. Whence it is good in the apoplexy, epilepsy, lethargy, sleepy diseases, and in hysteric fits. It may be given from six drops to a dram in any proper liquor.

BORAX is of two sorts, the one native, and the other refined. Native Borax is brought to us in bits of the size of large hazel nuts, and of a dark green colour, covered with a sort of earthy fat matter. It is found in various places, and is brought from the empire of the great mogul, and from *Persia*, where it is found in mines of metal, especially, those of copper, from whence proceeds a saltish, muddy, greenish water

ter, which is carefully caught, and being evaporated into a proper thickness, is afterwards poured into pits lined with a paste, made with the mud of these springs, and the fat of animals, which are also covered with the same paste. After some months they are opened, and they find the water concreted into stones. When Borax is purified, it appears clean, white, and transparent, somewhat like the crystals of Allum, with a slight saltish taste, and a lixivious sharpness. It is of the same substance with the native, and was formerly brought from *Venice*. It is imported to us from the *East Indies*, and principally from *Bengal*. When Borax is placed over the fire, it swells like Allum, and at length melts into a hard transparent mass, resembling glass, which, however, will dissolve in water. After examination, it appears that Borax is a sort of a fixed Salt not unlike that of Tartar; but differs from it in joining with acid Salts, without any effervescence. Borax is used by goldsmiths for soldering gold, and to render the melting of metals more easy; likewise it is employed by some dyers to give a gloss to their silks. It is given by physicians to promote child-birth, and to expel the dead child. The dose is from half a scruple to a drachm.



C H A P. XVII.

Of SULPHURS, BITUMENS and COALS.

COMMON SULPHUR or BRIMSTONE, is either native or factitious, or rather depurated. Native Sulphur commonly called Sulphur Vivum, is either transparent or opaque; the transparent appears like a gem of a gold colour, though some is met with that is yellowish or greenish. It is found in the gold mines of *Peru*, particularly in *Quito* in the island of *Milo*, in the *Archipelago*, and in the canton of *Bern*, in *Switzerland*. The opaque is usually met with in hard solid masses of a greenish shining colour, or under the form

form of an ash-coloured clayey glebe, inclining to yellow. It is in the greatest plenty at the feet of the mountains that throw out fire and smoke, such as *Vesuvius*, *Etna*, *Hecla*, and the like; as also in some parts of *Europe* and *America*, where there are sulphurous earths or fountains.

Factitious SULPHUR is prepared several ways; for in some places it is boiled in water, as at *Buda* in *Lower-Hungary*. At *Aix la Chapelle* in the hot baths, Sulphur is raised in vapours from the water, and sticks to the cover of the spring in hardish lumps, that have the appearance of flower of Sulphur, and a great quantity of this is gathered every year. Sometimes it is extracted from a whitish clayey earth. Likewise in the neighbourhood of *Rome* there is a Sulphur pit, whence Sulphur is got under the form of a fat white clayey earth, with blackish veins. This is put into large vessels, and then distilled, by which means the Sulphur runs into the recipient placed underneath, and in a short time concretes into masses. After the distillation is over, a reddish earth remains behind, which is thrown away as useless. It is often obtained from the stones called Pyrites, as in the diocese of *Liege*, where they are found like lead ore, which they break into small bits; then they put them into large earthen vessels of a square form, with narrow necks. These vessels are placed in a furnace inclining to one side in such a manner, that the fire underneath may melt the Sulphur, and so let it run out into leaden vessels filled with cold water, where it immediately concretes. The matter that is left in the vessels contains a great deal of Vitriol, which is extracted in the manner before described. Sulphur thus purified, is called common Brimstone, and is of a yellow or greenish colour; but the former is best for medicinal uses. Sulphur will readily melt over the fire, and when thrown upon live coals will immediately kindle, and emit a blueish flame, with a very subtle acid fume, which almost always occasions coughing. It is an electric body, and will not dissolve with acids, tho' it will with alkaline Salts and Oils. When kindled in the open air, it almost all burns away, leaving only
a little

a little metalick earth behind it. If the fumes or vapours that proceed from burning Sulphur are collected, they will turn to an acid spirit, like that of Vitriol, without any sign of Oil or Bitumen remaining. When Sulphur is distilled in a vessel, it will rise in the form of a yellow powder, which is commonly called Flower of Brimstone. When Sulphur is properly analyzed, it appears to consist of three substances in equal proportions; one of which is acid, another bituminous, and the third earthy and fixed. The acid liquor differs little from spirit of Vitriol. Sulphur is used as a medicine in disorders of the lungs, and is said to promote expectoration, and to cleanse and strengthen the lungs. It has always been counted excellent in diseases of the skin, and when used as an ointment with fresh butter, it will certainly cure a recent itch. Taken inwardly it loosens the belly, and promotes respiration, which last is so great, that it will colour the silver in a person's pocket. For this reason there is no doubt to be made of its blunting the sharp particles of the blood, and rendering it balsamic; upon which account it is sometimes made use of to cure small ulcers of the lungs and skin; but its virtue is in nothing more remarkable than in curing the piles, when a spoonful of the flower is taken every morning with milk. Some take it made into an electuary, by mixing four ounces of flower of Sulphur, one ounce of barley-sugar, and a sufficient quantity of syrup of maiden-hair together; and then the dose is half an ounce in a morning fasting, and at five in the afternoon. The spirit of sulphur is given for the same purposes as other acid spirits, making any liquor agreeably acid therewith.

ORPIMENT is an arsenical juice, compacted into glebes, consisting of thin scales or leaves, almost like lising-glass, which may be easily separated from each other. There are three kinds, one of which shines like gold, another is reddish mixed with a citrine colour; the third is greenish and mixed with earth; but the first is best. They are found in mines of gold, silver, and copper.

ORPIMENT has a sharptish taste, will dissolve in oil, readily take fire, and emit a copious fume, between the smell of sulphur and garlick. By the heat of the fire it will disperse in plentiful fumes, which if collected, concrete in yellowish flowers, like sulphur; and at the bottom of the vessel there will remain a blood-coloured melted mass, which, when cold, becomes thick and solid, like cinnabar. This, by some, is called red Orpiment, or Realgar. If this mass be kept longer over the fire, in a sublimating vessel, it will rise to the upper part, and there concrete into a transparent, red, elegant substance, like a ruby; but at the bottom there will remain a little metalick earth.

Hence it is plain, that Orpiment consists of the same principles as common Sulphur, only it is mixed with some mercurial particles. Some take it to be of a very poisonous nature; but *Hoffman*, after many experiments, by giving it to dogs, has found that it is entirely innocent. It is made use of by some barbers mixed with lime to take off the hair where it is superfluous; but if it lies on long, it will corrode the skin, which doubtless, is owing to the lime.

REALGAR, called ZARNICK by some, is, by others, named Red Orpiment. It is of two kinds; that is, native and factitious. The native, which is got out of mines, is of the colour of cinnabar, and smells like a mixture of sulphur and garlick when it is burnt. The factitious is made with Orpiment in sublimating vessels; for the yellow part will rise towards the top, and the mass that remains at the bottom is the Realgar. However, we are not to confound this with the red factitious Arsenick hereafter described.

Realgar is brought into *Europe* from *China*, in several shapes, which they call Pagods, these seem to be made by melting, not carving. Some ancient physicians have given this inwardly; the natives of the *East-Indies* make cups herewith, and the water poured therein, after some time, is used as an excellent remedy against several diseases. Some think that it would not have the like effect on *European* bodies; for

for they suppose the nature of man in the *East-Indies* and our's to be greatly different; but this is a mistake. However, it is uncertain whether Realgar be as innocent as Orpiment, or not; but that it is not poison is certain, for *Hoffman* gave two scruples of it to a dog, without the least bad consequence, and he was as well afterwards, as if he had taken nothing; but this is not the case with the flowers of Orpiment, for a scruple of these being given, it excited enormous vomiting; however, it did not kill, but if the flowers are obtained another way; that is, by mixing four ounces of Orpiment with three ounces of oil of Vitriol, they will yield an ounce of the flowers adhering to the neck of the retort, which are entirely innocent; for they are almost tasteless and promote sweat more powerfully, perhaps, than any other medicine.

ARSENICK, properly so called, is in *Bohemia* and *Saxony* extracted from a mineral called cobalt. If this be mixed with calcined flints and potashes, the mixture in a very strong fire, will turn into a glass of a blueish colour, that when reduced to powder is called smalt. In the preparation of this glass a copious smoke is exhaled, or rather flowers, which sticking to the sides of the furnace, and collected together, appear in the form of a white powder, which put into a crucible, and melted in an exceeding strong fire, turns into a white, heavy, hard glassy mass; and this is named white Arsenick, which is a most dangerous poison. But when to ten parts of the former powder, one of sulphur is added, and melted, as before, then yellow Arsenick will be produced. Again, if two parts of the sulphur are added to ten of the powder and melted, as before, it will turn to a reddish mass, which goes by the name of red Arsenick.

COBALT itself is a fossile body, which is heavy, hard, and almost black, not very unlike antimony; it has a sulphureous, nauseous smell when kindled in the fire, and is commonly mixed with a portion of brass, and sometimes of a little silver. Cobalt is found in some parts of *England*, and particularly in *Mendip* hills in *Somersetshire*; but some think it is not so good as that of
Saxony.

Saxony. Arsenick consists of an acid salt, a mercurial or metallick substance, and a small portion of sulphur. It is very volatile, for if a piece be put into a crucible over the fire, it will speedily fly away in a white smoke, leaving little or nothing behind. When melted with copper, it will turn it to a silver colour, but then it becomes brittle, and is of no great use, besides the tinge will be soon lost. Arsenick will corrode the skin, and taken inwardly will produce the most dreadful symptoms, which terminate in death, unless a large quantity of milk, oil, and fat broth be drank. There is but one medicine of any value obtained from Arsenick, and that is made by mixing crude antimony, yellow sulphur, and white Arsenick together, in equal parts, and then melting them in a glass cucurbit in a sand heat; when it is cold, it appears in the form of a dark red mass. This medicine is only used externally, by applying it to venereal buboes, with a large diachylum plaster; and also for sores occasioned by the king's evil, to the swellings of which it may be applied alone.

NAPHTHA or PETROLEUM is a mineral oil of a bituminous nature, which is inflammable, and has a fragrant smell. It is of several colours as white, yellow, red, and blackish. There is scarce any country where this bitumen is not to be found; but in the island of *Sumatra* there is an excellent sort, which by the inhabitants is called *miniac tanna*, which signifies oil of earth; and this is in high esteem in the *East-Indies*. The *Italians* are lavish in their praises of the Petroleum that is found in *Modena*, and is obtained from certain springs and wells. The earth of this dutchy abounds therewith; but that is most remarkable which is met with in the place called *Il Fumento*, where there is a well near forty yards deep, whose water is mixed with this oil. Near this is a castle on a mountain, and when wells are dug near the lower part of it, they will afford great plenty of reddish oil; but those that are in the upper part yield one that is white, but less in quantity. Twelve miles from *Modena* there is a noted rock, where there is a spring, on whose water a yellowish oil is seen swimming;

ing; and this will produce about twelve pounds of this oil in a week.

Petroleum readily flames, for which reason, in many places, it is used for lamp oil. It consists of fine volatile parts, upon which account, if a candle be held over the wells or fountains that yield this oil, the vapours will readily take fire. It is difficult to unite spirit of wine with Petroleum, it is of such a fat consistence. That Petroleum is generally counted best that is fresh, white, transparent, and having a subtile bituminous smell; the next in esteem is the yellow, then the red; but the black is worst of all. A few drops of this oil is given to children to kill worms; and it is used outwardly in the palsy, and for cold pains of the nervous parts.

Mineral PITCH is a kind of reddish or blackish bitumen, having a fragrant bituminous smell. It is of a middle consistence between petroleum and bitumen, and is not unlike tar. It grows more fluid in heat and thicker with cold; and it emits a flame when kindled. It is by some authors called Pissasphaltum, and springs out of the earth in several places between the chinks of stones. That at *Castro* near *Rome* rises through the clefts of stones, chiefly in the summer time, of the consistence of honey, and is of a black colour and a most subtile smell. In *Auvergne* in *France* there is a plentiful spring of this bitumen, which has the appearance of tar, it being black; but if it be kept a considerable time, it will grow harder, but not so hard as pitch. That most common in *England* is *Barbadoes* tar, which is a liquid bitumen, and is used externally, for all pains proceeding from a cold cause; as well as numbness, cramps, and palsies. It is given, inwardly, in pretty large doses, for the dry belly ach.

JEW'S PITCH is a sort of bitumen, which is solid, brittle, heavy, of a reddish black, shining, inflammable with a strong bituminous smell, especially when it is melted over the fire. It is found in several places, and particularly in *Judea*, from whence it has its name. It is found swimming on the top of the *Dead-Sea*, and is, at first, soft, thick, and may be readily pulled in pieces,

pieces; but, by length of time, it becomes harder than common pitch; it is known in the shops by the name Asphaltum. The true sort is seldom brought to us; for what we have is entirely black; only when it is broken, it has a saffron colour cast. It is now of little or no use in medicine, only it enters the composition of *Venice* treacle; but it is used by some for embalming dead bodies, and also by engravers to cover their copper-plates designed for etching.

AMBERGREASE is of an ash-colour, or grey, and is a fat solid substance, like suet, but light. It is variegated like marble, and is sometimes speckled with white specks; it springs from the bowels of the earth, is condensed in the sea, and is found floating on the water, though sometimes it has been met with on the sea shore, where it has been thrown by the waves. It is sometimes black as well as grey; but the grey is accounted best. Some have taken this for the dung of certain birds, others for acrement of whales, and others again for a rosin. However, there is little room to doubt that it is a sort of bitumen, which proceeds from the earth near the bottom of the sea; for it sometimes contains stones, shells, the bones of animals, and the bills and claws of birds, as well as honey-combs, from which the honey has not been all lost. Hence it appears that this bitumen must have been first in a liquid state; it has been sometimes found in lumps of above two hundred pounds weight. A great deal of this is got in the *Indian* ocean, about the *Molucca* islands; though it has also been found near *Africa*, and sometimes near the northern parts of *England*, *Scotland*, and *Norway*.

Ambergrease will readily melt in the fire into a sort of gold coloured rosin, which will kindle and burn when held to a candle. It will not dissolve entirely in spirit of wine, but leaves a black pitchy matter behind it. The solution, after some time, will deposit a white cloudy sediment, which will coagulate by little and little, and grow thick, especially by the evaporation of the finer parts of the spirits of wine; this being dried becomes a shining sort of earth.

earth, not much unlike sperma-ceti. It consists of oily greyish particles, which are very fine and volatile, with others that are thicker, saline, and bituminous. Ambergrease is of great use among perfumers, and is recommended by physicians for raising languishing spirits, and increasing their motion; whence it is in given for disorders of the brain and heart, as well as in fainting fits. The dose in substance is a pill of the size of a small pea, or from one grain to eight in a poached egg or wine.

AMBER is a hard bituminous substance, brittle, somewhat transparent, and of a yellow or citrine colour, though sometimes it is whitish and sometimes brown. The taste is somewhat acrid and bituminous, with a little astringency; the smell, when warm, is fragrant and bituminous; and when rubbed it will attract straws and bits of sticks by its electrical virtue. It is found in large quantities in *Prussia*, which is the country where it is chiefly got, particularly in the *Baltick* sea, near the shore of *Sudavia*, where it is found swimming upon the water, and is taken in nets. The places where amber is chiefly found are near the towns called *Fischhausen*, *Grobudstein*, *Abernichen*, and *Dakmonid*. However, this bitumen is not a production of the sea; for its water only serves to wash it off from the bowels of the earth, and remove it to places near the shore. The veins of this bitumen have been found, by the order of the king of *Prussia*. In digging for them they first met with sand, which being taken away, a stratum of clay appeared, and still deeper there was another like old wood, under which there was the mineral of vitriol, which being exposed to the open air, it was covered with an efflorescence of green vitriol. Still deeper there was a sandy mineral, out of which, with proper instruments, they got Amber in various places. By this means, in the *March* near *Kustrin*, as also in the *Tract* of *Stolpen* and *Dantzick* it was met with among sand, and found collected in a sort of heaps; whence it appears they were greatly mistaken who took it for the rosin of trees that dropt from them into the sea. It seems to proceed from the bituminous fossil wood,

just mentioned, by the assistance of the subterranean heat; which, at first, is probably like Petro-leum; and after passing through the mineral of vitriol, by the mixing therewith, becomes coagulated into a hard body. There is no doubt that it has been liquid, because it is often found in a round form, containing several sorts of insects therein; besides, the oil which is obtained from Amber, is, for virtue and smell, like Petroleum. *Charlton*, who was a very great naturalist, has sometimes found real Petroleum included in pieces of Amber, which is a farther reason to prove what is asserted. Add to this, that the acid of Amber is of a very fixed nature, and has the same virtue as the acid of vitriol, and almost all distilled oils, being mixed with strong oil of vitriol, are condensed into a mass like rosin. Moreover pit-coal by distillation and rectification, will yield an oil like that of Amber. The greatest plenty of this bitumen is found near the shore of *Sudavia*, after a violent north wind, attended with a tempest. Sometimes Amber is so transparent, as to serve to make burning glasses, one of which is kept in the cabinet of the Landgrave of *Hesse-Cassel*. Amber will almost wholly dissolve in a strong lye, particularly one prepared with the caustick salt of the regulus of antimony, which may be had from thence; when two parts of nitre are melted with one part of the regulus of antimony in a crucible, over a strong fire; if this be mixed with an equal quantity of Amber, and water poured thereon, being boiled together, the Amber will almost wholly dissolve, and the lee which had before a burning taste, becomes more temperate. Amber thus dissolved becomes a medicine for opening the obstructions of the bowels, and promoting all sorts of excretions; and consequently is a very useful remedy in chronical diseases. There is another method of dissolving Amber, for the making of a very fine hard varnish, by reducing a pound of Amber to powder, melting it in a crucible and pouring it on an iron plate; then it is to be powdered again, and returned into a crucible with a little drying oil, and afterwards with spirit of turpentine, till it is entirely dissolved. By this

process it plainly appears, that Amber contains a great deal of moisture, which may be first taken away by the help of fire, before it is mixed with the linseed oil and that of turpentine, with which it will afterwards easily mix.

Amber is said to be very efficacious in curing cold disorders of the brain, and particularly in pains of the head, sleepy and convulsive diseases, as well as in hysteric and hypocondriack fits and gonorrhœas. The dose is from a scruple to a dram in a poached egg, or any other proper vehicle. The volatile salt of Amber is diuretick, and accounted a specifick in hysteric and convulsive diseases. The dose is from ten grains to thirty. The oil is commended in nervous disorders, particularly in the gout, palsy, and catarrhs, by anointing the parts therewith. It is given inwardly from two to twenty drops.

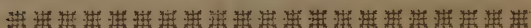
JET, called by some *Black Amber*, is a bituminous substance, that is dry, hard, black, smooth and shining, and being set on fire turns almost like pitch, emitting a thick black smoke, with a bituminous smell. It differs very little from pit-coal, especially the finer sort, which we call Kannel coal, if it be not the very same. It differs from a bitumen in not melting as that will do, and when distilled it yields a sharpish acid phlegm, and then a black oil; but last of all a substance like butter, or thick oil. It leaves behind it a very black *caput mortuum*.

PIT-COAL is universally known in these parts, and when distilled in a retort, first yields a phlegm, then a sulphureous spirit that is a little acrid, which is afterwards succeeded by a subtile oil, and then one that is more thick, which sinks to the bottom. With the greatest degree of fire there is produced a sort of an acid salt, like that of Amber, leaving behind it a light black earth. When the spirit is thrown on quick lime, it becomes volatile, and strikes the nose with a strong smell; spirit of nitre being added to this, a white smoke will arise, which yields a very pleasant sight. The fetid oil being mixed with salt of tartar, has the smell of a volatile salt, and when this mixture is distilled, it yields an alkaline

kaline, volatile, oleous spirit, which will turn syrup of violets green; but if it be mixed with an acid, it will immediately ferment, and become of a bright red colour. The thick oil of coals has a sulphureous smell, and being put into a silver spoon, with a gentle heat, will turn it of a blackish colour, which is a certain sign there is true mineral sulphur contained therein; for common sulphur, dissolved in oil of turpentine, will do the same. The acid salt, with spirit of sal-ammoniack, will excite plenty of bubbles, which may be seen at the bottom of the glass; and the mixture that before was limpid, turn to the colour of a ruby. This salt is very nearly like that of amber. From these processes it is plain, that coals contain nothing that is unwholesome; nor is there any arsenick at all in them, though some have supposed the contrary. Nor yet is the mineral sulphur which they contain so hurtful as some have imagined; for those that are employed in the melting and preparing sulphur are as well, and in as good case as other people, and much better than miners of other kinds. However, if there were much sulphur in the Coals, it might certainly be obtained from them by some method or other. It is plain therefore, that they consist of a spongy earth, impregnated plentifully with bituminous juice; and if they are deprived of the bitumen, they can never be made to flame or smoke. Hence it appears, that Coals are so far from doing any harm, that they are rather beneficial, by drying up the too great humidity of the blood, and preserving the body from putrefaction; for it has been observed by *Galen*, that all bitumens, being kindled, mend the disorders of the air, by dispersing their too great humidity; which opinion has been hitherto followed by all physicians. Where the atmosphere is very moist, and full of watery vapours, so hurtful to human bodies, the burning of Coals is certainly very proper. In former times, when the plague and other infectious diseases were common, they were wont to burn bitumen to purify the air; and this is certain, that in *London*, since the burning of Pit-Coal has been almost universal, no plague has ever affected that city,

nor any disease of that kind, and therefore there is no reason to be afraid of it, unless it be brought from other countries.

There are mines of Coals dug in various parts of *England*, which generally differ, in some respect, from each other; those brought from *Newcastle*, improperly called Sea-Coal, are remarkable for their being generally small, and caking on the fire. These are the best for broiling flesh, which others, in various parts of the kingdom will not do, particularly in *Staffordshire*. Kannel Coal, which is dug up in *Derbyshire* and other places, is famous for its fineness, as well as hardness, though it will burn like a candle; there are now several things made with it. Such as the tops of snuff-boxes, salt-cellar, and the like. It is also found in *Staffordshire*, and it is remarkable, that the choir of the cathedral church of *Litchfield* is paved therewith; that is, the black part with Coal, and the white with alabaster, which look like black and white marble. It will turn, like ivory, into ink-pots and candlesticks; and some have their coats of arms carved thereon. The other Coals most used in *London* are brought from *Wales* and *Scotland*, and are valued for burning clear without a great deal of smoke.



C H A P. XVIII.

Of METALS and SEMI-METALS.

ANTIMONY is a mineral, consisting of sulphur and a mercurial arsenical substance, as is universally allowed by the chymists. It is solid, heavy, brittle, of the colour of lead, consisting of long shining streaks, and will melt in the fire, but is not malleable, in which it differs from a metal properly so called. There are several kinds of it, one of which looks like polished lead; but it is brittle, and mixed with a sort of crystalline stone. Another consists of slender shining lines,

lines, that look like needles placed in rows, in some places, and in others without any order. A third kind is made up of broader shining plates; and a fourth of small lead coloured rods, which melts in the fire as readily as sulphur, on account of the large quantity of that substance contained therein; this is found in *Italy*, near *Massa* in *Tuscany*. There is still another kind, which may be distinguished by saffron coloured, or reddish spots dispersed here and there; and this is met with in the gold mines of *Hungary*. In short, there is scarce any part of the world where this mineral is not to be met with, and though they seem to be of so many different sorts, yet their natures are nearly the same.

The Glebe of Antimony is generally mixed with a stony substance, which it is freed from by melting. They first break it into bits, and place it over the fire in earthen vessels, with holes at the bottom, under which there is another earthen vessel in the form of a cone, and when it is in fusion it runs through the holes, and leaves the dross behind. That which is hard, heavy, of a lead colour, with shining streaks, placed like rays, is accounted the best, and the *Hungarian* Antimony for this reason is chosen for medicinal purposes. The sulphur in Antimony may be readily perceived, not only from the smell, but from the blueish flame it emits while it is melting. Besides, when nitre is thrown into the crucible, containing red hot Antimony, it flashes in the same manner as with common sulphur.

It was formerly thought that the sulphur of Antimony partook of the nature of gold, for which reason they employed themselves to little purpose in making experiments to extract the fine sulphur therefrom. Notwithstanding this, it is now generally acknowledged, that the sulphur of Antimony is exactly of the same nature as common sulphur, though all the reguline parts are seldom extracted from it; nor yet can that be called the pure sulphur that rises in flowers, when sublimed; for though it takes fire like sulphur, yet the fume is of a whitish-yellow like that of orpiment. Besides, that it is not pure may be

known by its effects; for it will occasion violent vomiting, which is a certain sign that it is not entirely freed from the reguline particles. If you take white arsenick and mix it with half sulphur vivum, and afterwards sublime the mass, there will arise reddish flowers, which, when taken inwardly, have a very violent operation, and when they are set on fire emit a reddish fume; for there is such a force in mineral sulphur, that it will readily join with the arsenical particles, and carry them up therewith, when sublimed.

Cinnabar of Antimony confirms this truth; for it is well known, that scarce a fourth part of it is sulphur, and yet, though a light spongy body, it will carry up with it three parts of mercury, which is the heaviest of all metallick substances, next to gold. The golden sulphur of Antimony is obtained by mixing that Semi-metal with nitre and tartar; as also with tartar alone, and its salt, and then melting it, afterwards separating the regulus from the dross in which the sulphur of Antimony dissolved by the alkalious salt is contained. This dross is to be boiled in water, and afterwards mixed with an acid liquor; this will cause an orange coloured powder to subside, which, partly from the colour, and partly from its imaginary nature, is called golden sulphur; which, however, is not wholly freed from the reguline particles. But yet, there is a method of gaining it pure, by taking one part of the martial regulus of Antimony, two parts of crude Antimony, and half a part of nitre, which being melted together, will yield a very large quantity of regulus, in proportion to the weight; that is, one pound of Antimony will yield seven or eight ounces. Afterwards, it is to be separated from the dross, in which there is nothing left but iron with the sulphur of Antimony and some terrestrial particles mixed therewith. Upon this must be poured a sufficient quantity of the spirit of vitriol, which will dissolve the iron and leave the sulphur behind, this is nothing better nor worse than common sulphur. If Antimony be reduced to powder, and calcined in the
open

open air, stirring it continually, it will turn to a grey calx, which has no violent operation, and yet will do wonders in curing various diseases, when used in a judicious manner.

There is no substance in the world that yields so powerful a poison, and such efficacious medicines as Antimony; however, when crude, it has no violent operation, and yet, taken in a proper quantity, may be given very advantageously in many cases; both to men and cattle. But if crude Antimony be melted in the fire, and mixed with the like quantity of nitre, by little and little it turns to a poison; and yet, if Antimony is mixed with one part of common salt, and calcined over a gentle fire for some hours, continually stirring it with a spatula, and afterwards edulcorating with water, there will remain an ash coloured powder, which has no violent operation, but will promote a gentle sweat. Moreover, if you take four parts of Antimony and four of salt of tartar, and melt them, and then pour them into a cone proper for that purpose, you will have the medicinal regulus of Antimony, which may be beaten into a reddish powder of extraordinary virtue. But if, instead of one part of the salt of tartar, two or three be made use of, and then melted, the regulus will be changed to a poison, which is occasioned by its being deprived of too much of its sulphur; which is plain from hence; that is, from taking white arsenick, mixing it with an equal part of common sulphur, and melting it on the fire, it will turn to a mass that has no violent operation when taken inwardly.

Crude Antimony reduced to a fine powder, and taken inwardly, is very useful in several diseases; for it will dissolve the clamminess of the fluids, open obstructions, and is a good remedy in diseases of the skin. It is also excellent against the rheumatism, and will take away numbness of the limbs, which sometimes happens after salivations. The dose is about half a drachm. Antimony is also useful to various artificers; for pewterers mix it with tin and lead to make their pewter shine, and to give it the sound of silver; bell-founders mix it with other metals in mak-

ing their bells; likewise the letter-founders constantly employ it in making their types. Add to this, that goldsmiths make use of it in purifying gold; for when melted therewith, it will destroy all other metals, not excepting silver, and turn them into dross.

BISMUTH is a semi-metal, which will melt in the fire, but is not ductile; it is heavy, brittle, and differs from lead and tin in its colour and hardness; for it sometimes looks like silver, and sometimes is of a faint purple colour, not unlike regulus of antimony, though it consists of broader plates. Bismuth is sometimes found in so very pure an ore, that it stands in need of no other operation to fetch it out, than by breaking it to bits. In the Musæum of the Royal Society there are pieces of Bismuth sent from *Cornwall* under various names, that are so very rich that if a piece of it be only held, with a pair of tongs against a clear fire, the Bismuth will run down in the form of melted tin, almost as soon as cheese will drop in toasting. Some call the ore of Bismuth the cobalt of Bismuth, because it contains the same principles as real cobalt, only in a different proportion. It is by some called tin-glass; and, when broken, appears to consist of small cubick particles, and these again of minute plates applied to each other. It is more brittle than zinc, though it differs little from it in external appearance, except in colour. It will cause the metals that will not easily melt to be more fusible by a much less fire than they otherwise would. It mixes easily with any metal, and according to the greater or less quantity added thereto, it renders them more or less white and brittle. But as Bismuth is easily destroyed, its mixture with metals difficult to be melted, should be made in close vessels. It is very observable, that Bismuth melted with lead, tin, or silver, and afterwards amalgamated with Mercury, will pass through leather in much greater quantities than they otherwise would. Some have affirmed, that Bismuth is only to be found in *Misnia* and *Bohemia*, or, at least, that there

there are no mines of this semi-metal but what are at those places ; and yet it is certain, that it may be found in *Cornwal*, as has already been hinted at. It is of little use in medicine, though some pretend, the flowers of Bismuth are a diaphoretic ; but it is generally disapproved on account of the arsenical particles contained therein. Its magistery is prepared by dissolving it in spirit of nitre, and afterwards precipitating it with water impregnated with common salt. When this powder is washed it is very white, and used by the ladies as a beautifier of the skin.

ZINC is a semi-metal of a blueish-white colour, brittle, and yet somewhat ductile and malleable, though much less than metals. It melts in a gentle fire, after which it smokes, and then sticks to the furnace in the form of exceeding white flowers. In a greater fire it burns, and emits a flame of a most beautiful green colour. All the Zinc that is prepared in *Germany*, especially at *Gefslaer*, is obtained by sublimation, and not by melting ; nor is it got out of any singular ore, but out of such a confused mixture of different ores, that several other metals and semi-metals may be separated therefrom at the same time. There is no particular kind of sublimation for the extracting of Zinc ; for it is collected during the melting of other metals, especially lead. The ores that yield Zinc are, by long and repeated roastings freed from sulphur, and in a manner from arsenick, by the same operation. When laid into strata with coals, they are put into prismatical quadrangular furnaces, the height of which is greater, by several times, than the length and breadth. Three sides of the furnace are thick walls ; but the fourth, which is the front, is shut up close with plates of fissile stone, not above an inch and a half thick. There is another plate made of the same stone, applied within to the lower border of these plates that is nearest the bottom, and placed in such a manner, that rising up obliquely, and inwardly from the said border, they make a channel declining to each side of the furnace, terminating in a hole left in that part, and designed to carry

from thence into this hole whatever falls into its cavity. If the ore is melted in a large fire, which is excited by bellows placed below the back part of the furnace, the Zinc, which is volatile, will at the same time apply itself drop by drop, to the foremost wall of the furnace, and to the joints of the plates of which it is made, because these joints form unequal chinks and furrows. During the melting, this wall is to be struck gently many times, and the Zinc will fall drop by drop into the channel just described, from whence it will run towards the small hole, and from thence into a vessel underneath.

However, there are certain substances that may be more properly called ores of Zinc, such as lapis calaminaris, or calamine; as also native cadmia. This is of a very irregular figure, sometimes spongy, and now and then solid. It is sometimes of a yellow gold colour, sometimes red, and at other times grey; or of the mixture of them all. It is not very heavy nor hard; and, when broken in pieces, it immediately renders a flame of a greenish colour, and exhales a white, thick, copious fume, of a smell peculiar to itself, which condenses into very light flowers, at first blueish, and then of a greyish-white. But care must be taken that the calamine be not mixed with a yellow sulphureous pyrites, or the white arsenical one, nor yet with lead ore.

Zinc, by some called Spelter, and by others Tuttenag, mixes readily with lead and tin, rendering them more brittle and less malleable. When it is by fusion mixed with four times the quantity of copper, it becomes a brittle metal of a gold colour, which is well known by the name of princes metal or bath metal. If you put a few ounces of Zinc into a pot, or a small earthen cucurbit, placing it horizontally, or rather, with the mouth upwards, in a reverberatory furnace, proper for the distillation of the oil of vitriol, and sit thereto, by means of an aludel, a large glass receiver, in such a manner that you may look through its transparent bottom into the cavity of the cucurbit; then
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if your fire is very brisk you will see the melted Zinc emit a flame of a green colour, with a very thick grey coloured smoke, which will be pushed forward into the receiver like cobwebs fluttering in the air, and covering the inside of it. After the fire is continued for an hour or two, let the vessels cool, and afterwards open them; at which time a thin fume smelling like garlick will break out, and soon vanish. The receiver will be covered on the inside with very soft impalpable light flowers of a blueish-white colour; and the aludel will be incrustated with those that are more heavy, and consisting of coarser grains; besides which there will be solid sublimate produced from the small drops of sublimed melted Zinc with the greyish flowers every where interspersed.

If you expose two or three ounces of Zinc to a middling fire, having a draught of air in an open earthen cucurbit, supported by a stone, the Zinc will flame sooner than in a close vessel, and fill its cavity with very white flowers, like locks of wool. However, the flame which was very bright before, will gradually diminish, till it ceases entirely; and then the Zinc will deflagrate no more, not only in the same but a stronger fire. But if you take away the flowers with a small iron ladle, as well as those from the surface of the melted Zinc at the bottom, a bright flame will be produced, as before, and the vessel filled with flowers of the same kind. By repeating this process all the Zinc will be turned to very white flowers, especially if the Zinc be pure; nor will there much of it fly away, unless the flowers be violent; for if you apply suddenly the strongest fire with a draught of air, all the Zinc will vanish. Hence the reason is plain, why Zinc cannot be procured from any of its ores, in its own semi-metallick form.

That part of the concrete which sticks to the walls of the furnace, and breaks off from time to time, is called furnace cadmia, which being melted with copper makes what we call brass; but before it is fit for the operation, it must lie a long time in heaps with dross, exposed to the open air, where it

will become of a lighter texture, and then it is fit for tinging copper of a yellow colour. It is much of the same nature of tutty; for that will turn copper into brass. The white flowers of Zinc taken internally promotes sweating, and sometimes they will work upward and downward. The dose is from four grains to twelve. The making of prince's metal is by melting three ounces of copper with half an ounce of Zinc, and when the mass is cold, it will appear of a fine gold colour, remaining ductile with a hammer.

COBALT is a ponderous mineral finely streaked, or sometimes granulated. It is often smooth on the outside, of a light greyish, and almost semi-metallick colour, and sometimes of a dark blackish dye. It contains a great deal of arsenick, as well as a certain fixed earth, which being melted with flints, and fixed salts, turns into glass of a fine blue called Smalt, which has been taken notice of before. Cobalt commonly contains bismuth. However, there are several minerals which go by the name of Cobalt, that have different properties from the former. That called the flower of Cobalt is finely streaked, lighter than the foregoing, and of a fine red purple colour, and belongs to this class; for it is a very arsenical mineral, and loses one half of its weight in the fire; but a great deal of bismuth may afterwards be melted out of what remains. This will likewise give a blue colour to glass, like the other Cobalt. There is also a certain mineral that is rich in arsenick, which has somewhat of the appearance of the true Cobalt, of a grey reddish colour, and looks like a semi-metal. It contains a little copper, as well as sulphur, and is called by the *Germans*, *Kupfer-nickel*.

Native CINNABAR is a fossil metallick substance, heavy but not very hard; which is either found pure, or mixed with stones. One of the sorts when pure, is of a purple colour inclining to red, and when ground, becomes of a beautiful red. There is another of a blackish, or of a liver colour, like blood-stone; and another yellowish. That sort of Cinnabar that is mixed with stones, is often found in a
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fissile ash-coloured stone, and sometimes in a very white metallick stone. It is sometimes met with under the form of pyrites, of a gold or silver colour. It is met with in various places, as in *Carinthia, Hungary, Bohemia, Italy, Spain and France.*

It is known almost to every one, that it contains plenty of quick-silver, which is got from it by distillation, with the assistance of quick-lime or filings of iron. Sulphur may be extracted from it, though in a small quantity, if it be boiled in a strong lye, and separated from the quick-silver by pouring distilled vinegar thereon. Besides, Cinnabar may be made by art, not much unlike the native, as will be taken notice of hereafter. Native Cinnabar was much in request formerly among the painters; but now is seldom used, because the factitious Cinnabar is altogether as beautiful, and much cheaper. It is recommended by some physicians for internal use against the epilepsy, vertigo, madness, and disorders of the head. For this purpose the *Hungarian* is best, which is of a bright red colour, and without any mixture of heterogenous particles; however, it sometimes happens, that native Cinnabar, on account of the vitriolick particles it is mixed with, which sometimes, partake of the arsenical, will excite vomiting, and anxiety about the heart; for this reason factitious Cinnabar, or Cinnabar of antimony is generally preferred before it.

QUICK-SILVER or MERCURY is a metallick fluid substance, cold to the touch, of a shining silver colour, very heavy and volatile, and readily mixes with most other metals. It is either found fluid in the bowels of the earth, in the chinks and veins of mines from whence it is collected, and washed with plenty of water to separate it from the earth, or it is dug out in glebes, consisting of a red mineral sulphureous mercurial substance called cinnabar. It is also found in the form of a slimy or stony glebe of divers colours; it being sometimes red, yellowish, brown, or of a lead colour. From this last Quick-silver may be obtained by simple distillation, without
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the addition of any other matter, either by ascent in a retort, with a proper fire; or by descent, which is the common way, and is done in the following manner: They pound the mineral, and throw it into earthen vessels with a narrow neck, stopping it up with fresh-moss from trees; then they place another over it, with a wider mouth, and bury them in the earth, with one of the mouths against the other, coating them all round with clay, and luting the mouths together, in such a manner, that the empty vessel is entirely hid under the earth, and that which is full placed above it. This is done in an open place, and many of them ranged in rows, after which they make fires all round them, by which means the minerals are heated, and the Quick-silver falls by drops into the lower vessel.

The mines of *Hungary*, *Carinthia*, and *Carniola*, are rich with Quick-silver; and there is some about *Montpelier* in *France*, as well as in *Normandy*. But if the mineral abounds with sulphur, the Quick-silver cannot be extracted without the addition of some other substance, such as quick-lime and filings of iron, already taken notice of, as also wood-ashes.

Quick-silver exceeds all other metals in weight, except gold; for that will sink therein, while others swim at the top. The weight of gold compared with Quick-silver is a little more than four to three. It will mix or amalgamate with all metals, or semi-metals, though not without difficulty, with antimony, iron, and copper. It penetrates the metals, renders them brittle, and dissolves them; for which reason it is accounted by some the first matter of metals; but this opinion cannot be supported by experiments. Some will not allow it to be a metal, but a metallick body only; over the fire it will fly away in exceeding fine particles or fumes. It may be made to put on various appearances, which are all reducible to running Quick-silver again. It joins very readily with sea-salt, and turns therewith, by a gentle heat, into a white crystalline mass, called corrosive Mercury sublimate; but it will not do the same with nitre and vitriol.

triol. It will readily dissolve in spirit of nitre ; but not without great difficulty with the oil of vitriol. It undergoes no change with alkaline salts ; but it may be killed and fixed with salino-sulphureous bodies. Being ground some time with sulphur, it will turn into a very black powder, called *Æthiops mineral* ; which, by the assistance of fire, may be sublimat d into a very red radiated shining mass. Quick-silver being dissolved in spirit of nitre, and the acid spirit exhaled by fire, a red powder will remain at the bottom, called red precipitate ; but if it be precipitated with salt of tartar, a brown powder will fall to the bottom, named precipitate of *Wurtz* ; but with sea salt it will be white, and with lime water yellow.

The analysis of Quick-silver is very difficult, because it frequently flies away with the heat of fire ; however, if it be exposed to the heat of the fire in a glass vessel, with a long neck, it will, at length, become a grey powder, then yellow, and, at last, red ; at which time it is somewhat more heavy than when fluid. But if this be exposed to a more violent heat, it will fly away, leaving only a little brown earth behind it.

Quick-silver being exposed to the focus of a large burning-glass, will immediately fly away in fumes, leaving nothing behind ; but if the red powder, last mentioned, which is called Mercury calcined *per se*, is exposed to the focus upon a tile, it will turn to a sort of glass, which, however, will soon evaporate in fumes, except a little brown powder, that will at last change to brown glass ; though, perhaps, this may be nothing else but what proceeds from the tile it was laid upon.

Quick-silver, by the ancients, was accounted a poison, and *Avicenna* was the first who ventured to use it externally ; but upwards of two hundred years ago some had the courage to use it internally, because they observed that it did sheep no harm, when it was given them by their shepherds to kill their worms. *Matthioli* observed, that certain women took a pound of Quick-silver at a time to procure abortion, without doing them any harm ; and it is commonly known,
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that the men that get Quick-silver out of the mines will swallow some of it to cheat their masters, and after it comes away by stool will sell it. However, Quick-silver cannot be said to have no bad effects; for those that are employed in digging for it, seldom continue four years without being affected with a trembling of the limbs and a palsy, of which they die.

However Quick-silver has a remarkable virtue in opening all obstructions of the vessels and glands, and of dissolving the thick gross matter contained therein, for which reason it is given in schirrosities of the liver, spleen, and mesentery, as well as in obstructions of the glands. It will also temperate the acrimony of the blood and humours; for which reason it is given in venereal swellings and ulcers, as well as in diseases of the skin. Quicksilver not only taken inwardly but applied outwardly in an ointment will purge the body by stool, sweat and insensible perspiration; but its most remarkable effect is that of salivation.

That Quick-silver is counted best that is of a shining silver colour, very fluid, and when held over the fire in a silver spoon, will fly away, without leaving any thing behind it. That which is of a livid colour and does not separate into drops that are exactly round, is naught, and shews that it has been adulterated with lead or bismuth. However it ought always to be cleansed, which may be done by squeezing it thro' shammy leather; but the best way is to distil it in a retort with quick-lime, pot-ashes, or iron filings. Crude Quick-silver may be given to kill worms from a scruple to a dram; and it may be rubbed on glass with sugar till it is dissolved, if a drop or two of oil of sweet almonds be added thereto. A pound of Quick-silver may be also boiled in pure water for an hour, and some of the clear liquor given to children for their common drink. It will kill worms taken inwardly, and lice when applied outwardly with an ointment. Crude Quick-silver is sometimes given to the quantity of two or three pound, with oil, to force a passage through the guts in the iliack passion. It is common to make Quick-silver girdles for curing
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the itch, by shaking it together with the white of an egg, till it is converted into froth, and then a linnen girdle is to be smeared with it, and worn round the middle.

LEAD is of the least value of all metals, it being heavy, livid, and fouls the hand with a blackish colour; it yields little or no sound, and melts quickly in the fire before it turns red. Pure Lead is seldom found in the mines, but is extracted from ores of different kinds; for it is sometimes black, blue, yellow, or of an ash colour. It is sometimes full of shining minute particles, and sometimes again it is like a stone of a leaden shining colour, consisting of squares like dice, that lie in a white or reddish stone. The ore of Lead, almost always contains a small quantity of silver; and particularly that of *Cardiganshire* in *Wales* has so much of it, that from two thousand pound weight of ore, there has sometimes been extracted twenty pounds of silver. *Cramer* affirms, that Lead ore has always a cubical figure, unless it has been altered by some external power or resistance; and even in this case it has always the same form within. Lead ores are called by different names, according to the various regular or irregular application of the cubes to each other, according to their magnitude, and their brightness depending thereon; and according to their surfaces, whether smooth, rough, or granulated.

Ercker mentions a red kind of Lead ore, which he says is ponderous, and like red clay; and, upon examination, this ore, which has been mistaken for cinnamon, is nothing more than the Lead ore, having here and there larger cubes, easy to be distinguished by the naked eye, and an infinite number of very minute ones, not to be seen without a microscope, because they lie hid in a red marly kind of earth. The same author mentions another red ore, resembling a white sandy stone; and there are also sandy rocks very rich with lead: but being well examined, the ore contained therein does not differ from the common sort. The rock which contains it is commonly soft; the ore looks globular on the outside, and the whole substance of the rock is filled with
small

small masses of various sizes not very bright; but when the rock is broken, there appears the perfect species of Lead ore.

When flints and the like are mixed with an ash or black colour, or are only marked here and there with veins and spots of the same, it is a sign that they contain either Iron or Lead. The green Lead ore is very rare; but when it is found it is variegated with a yellowish green colour and semi-transparent. It is likewise heavy but not hard, and one hundred weight of it yields from seventy to eighty pounds of Lead. There is also white and ash-coloured Lead ore, but it is as uncommon as this.

There are several mines of Lead in *Spain*, *Italy* and *Germany*; nor is *France* without, though the metal be extracted with difficulty, but the best and richest are in *England* and *Scotland*. The method of obtaining the metal, is by placing the ore between strata of coals, and then when the fire is kindled the metal will flow; or pieces of wood may be used instead of coals or mixed therewith, according to the degree of fire that is required; for coals yield a more violent fire than wood.

The weight of Lead compared to Gold is as three to five. Lead is easily calcined and reduced to an ash-coloured calx, which in a more violent fire turns yellow, and at length red; when it is called minium, or red lead, which may be easily reduced to Lead again, when mixed with combustible matter and melted. Lead mixed with nitre in a crucible will flash a little, and if the filings of Lead be thrown into the flame of a candle, it will tinge it with a blueish colour. From whence it appears, that there is a sulphureous principle in Lead, though in a small quantity. When Lead is exposed to the focus of a large burning-glass it will immediately smoke, and by little and little change into an ash-coloured calx, then yellow and red; afterwards turning to a saffron coloured fluid, like oil, which in time, will fly away in smoke; but if this fluid, before it is quite dissipated, be taken away from the focus, after it is cold, it will turn into a red, or reddish yellow mass, consisting of thin plates like

like orpiment, which are transparent and look like Talc. But if this be applied to the focus of a large burning-glass, upon coals it will immediately melt and turn to Lead again. From hence it appears, that Lead consists of a glassy earth, not much unlike Talc with a sulphureous principle, that is inflammable, and not mixed intimately with the earth.

Lead will dissolve all other metals, except gold and silver, and carry them off along with it, or turn into litharge or fly off in smoke; for this reason it is used for the purifying gold and silver. It will not rust in water like iron or copper, but it will dissolve in vinegar, spirit of vitriol, and spirit of nitre; and the salt which is obtained therefrom, when the spirits are evaporated, will have a sweetish taste, whence it is called sugar of Lead. It will also dissolve in oil and all fat substances. When Lead is reduced into a calx, though it emits a copious smoke, and loses much of its substance, it will increase in weight, in-somuch, that an hundred pounds of Lead will increase to an hundred and ten, when it is converted into red Lead; but if this afterwards be reduced to Lead again, it will not yield near an hundred pounds. When red Lead is melted with sand it obtains a yellow gloss, not much unlike amber. Several preparations of Lead have formerly been used as medicines, but as it is an enemy to the nerves, it is in a great measure left off, and ought to be intirely abandoned. It produces a heaviness in the stomach, with intolerable gripes, suppresses stools and urine, and causes a trembling of the limbs, with difficult breathing, and at last death. This many have experienced to their cost, when acid wines have been sweetned with litharge. The calx of Lead, and red Lead are prepared by putting the Lead into an unglazed earthen pan to melt, and after it is melted, by stirring it with an iron spatula till it is all turned into blackish or ash-coloured ashes which are the calx of Lead. If it be continued a little longer it will turn yellow, and then it is called by the painters masticot. After this, if it be calcined in a reverberatory furnace, it will become red, and is the minium or red Lead of the shops. Its use
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in medicine is to blunt the acrimony of the humours, to allay inflammations, and to correct malignant ulcers, after it is made into an ointment.

Litharge is generally made in the furnaces of metals, when Lead is separated from silver, or when Lead is made use of to cleanse silver from other metals mixed therewith; and it sometimes is of a silver, and sometimes of a gold colour, whence it is called litharge of gold or silver, though it does not receive its colour from those metals. Litharge is of great use in making plasters of which it is the basis, being mixed with oil. It is a moderate drier, and cleanses with a little astringency, and is proper to bring ulcers to a cicatrix; it is also useful to heal the galling of the thighs.

Cerufs, or white Lead, is a sort of rust of Lead prepared in the following manner: The sharpest vinegar must be put into wide mouthed vessels in the summer-time, over which a plate of Lead is to be placed so closely, that nothing can escape out of the vessel: In about ten days the plate will be dissolved, and fall to the bottom of the vessel from whence it is to be taken and dried, and afterwards ground in a mill. It is also made from the filings of Lead put into very sharp vinegar for ten days together; or a plate of Lead may be put therein, and taken out from time to time to scrape off the white part; and so again, and again, till the whole plate is dissolved; then all the scrapings may be collected, ground, and made into masses with vinegar.

TIN is one of the softer and more ignoble metals; and is white, shining, brittle, sonorous, and crackles when bent. It is the lightest of all metals. and never existed naturally in a true metalick form. The richest Tin ore is of a black or dark colour with many sides of an irregular figure, and a glossy surface. It is heavier than the ores of all other metals, which is somewhat strange, because Tin is lighter than all the rest. It is indifferently hard, and bears a quick fire without melting or growing clammy. But the most common Tin ore is of a dark, yellowish, rusty colour, and is very like the ore of iron; it is like the former
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in shape, and seems only to differ from it in its degree of purity. The garnet is a sort of precious stone, and now and then contains Tin; so that, upon this account, it is reckoned among the ores of this metal.

Tin, in *Cornwall*, is extracted from its ore, after it is separated from the stone to which it is connected, by pounding it with iron pestles, and in the mean while it is continually washed with water, that the earthy parts may be carried away therewith; and that the metallick particles may sink to the bottom. This gross powder, after it is dried, is ground with stone mills, and then washed, till it is quite freed from all foreign matter. Than it is dried and thrown into a furnace, mixed with charcoal, which being lighted and blown with bellows, the Tin will melt and fall to the bottom of the furnace; when the workmen opening the small door of the furnace, suffers the metal to run into sand prepared for that purpose, where it forms large masses. The upper part of the Tin is so soft, that it is not fit for use without copper; and therefore they mix three pounds of that metal with an hundred of Tin. The middle part only requires two pounds of copper; but the lowest is so brittle, and so unfit for use, that they mix eighteen pounds of lead with an hundred of Tin.

There is often an arsenical substance mixed therewith, which they call mundick, that is of a shining dark colour which blackens the hands; and which however, by the help of fire, flies away in smoke. There is also another white saponaceous substance, which is soft, and may be dissolved in water at first; but soon after turns very hard. It is a kind of marl. The weight of Tin, with regard to gold, is as three to eight; and is easily melted and reduced into a whitish calx. If a bit of tin placed upon a tile be brought to the focus of a large burning-glass, it will emit a thick smoke which will leave a white calx behind it, that will in time change into slender crystals, or rough crystalline filaments. This substance will not melt again, unless it be mixed with fat or powder of charcoal, and then it will readily be converted into Tin again.

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The filings of Tin thrown into the flame of a candle, will turn it blueish, with a sulphureous smell, a little like garlick. Tin thrown into a crucible with nitre will emit small flashes, from whence it appears, that this metal is composed of a certain crystalline earth, and a sulphureous inflammable principle, which, perhaps is mixed with a little arsenical salt.

Tin will melt sooner than other metals, and will adhere to them very readily; for which reason copper and iron vessels are often tinned on the inside, to hinder them from rusting, and to prevent the bad effects of the copper. If it be mixed with these metals, it renders them more hard and brittle, and cannot be separated from them without great difficulty; upon which account some call it the Devil of metals. Tin will not dissolve in any spirit, unless it be aqua regia; and its solution will tinge gold with an elegant purple colour.

The virtues of Tin are now well known, taken as a vermifuge; for it will kill worms, taken either in powder or filings, from a scruple to a dram for several days. Salt of Tin is made of that metal reduced to a calx, by exposing it to a reverberatory fire for two or three hours, and then throwing it into very strong distilled vinegar. This is recommended in hysterick fits, and is given from two grains to six. Mosaick or musive gold is made in the following manner: take of fine Tin one ounce, of Mercury revived from cinnabar, ten drams, and make an amalgama, which must be mixed with ten drams of common sulphur, and an ounce of sal-ammoniack. All these being finely ground together, must be sublimed in a strong fire for four hours; and a sort of cinnabarine substance will be raised to the upper part of the vessel; but at the bottom a kind of a spongy substance of a gold colour will remain, which being washed in several waters, is called musive gold. It is of great use to painters, and in medicine has a diaphoretic quality. It is accounted good in hysterick and hypochondriack disorders, as well as for the killing of worms. The dose is from ten grains to thirty. Some have supposed this to be a mercurial preparation, but false-

falsely; for all the mercury is raised from it in sublimation.

IRON is an ignoble metal, remarkable for its hardness, and is of a whitish livid colour when polished; but before that it is blackish. When it is cleansed it is called steel. The ore of common Iron is of no certain form; but is most commonly of a rusty colour. There is also an ore which is very heavy, and of a red blueish colour when broken. It is very rich in the best kind of Iron, and usually yields at the first melting, from sixty to eighty pounds out of an hundred weight. There is also a singular kind of Iron ore, of a pale yellowish colour, though sometimes grey; and sometimes of a kind of semi trans-white. It will yield, when melted, about thirty pounds of Iron out of an hundred weight.

The HÆMATITES or Blood-stone is also a sort of Iron ore, and is very smooth on the outside, when the rust is taken off; but the inside is composed of convergent streaks. It is of a dark red colour, very heavy and hard, and is one of the purest of the Iron ores, with a small mixture of arsenick. Smiris, called in *English* emery, is the hardest of all the Iron ores hitherto known, and is almost as heavy as the blood-stone. It is of a brown colour and certainly contains Iron, though it is not worth while to employ it for that purpose; and therefore it is used by workmen, when pounded, to polish steel and other things. Magnesia or Magnanese has no certain figure, is of a greyish black colour, and contains Iron; but it is not worth while to make use of it on that account, because it will not answer the charges. It is used in glass-houses to take away the green or blue colour of glass. There is also another sort of ore not unlike the former, of a shining streaked dark grey colour; but is seldom or never employed for that purpose. It is called by the *Germans* Eisenman. Several other kinds might be added, but as they are never used for the obtaining of this metal, they need not be mentioned.

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When iron is melted it is formed into large masses, which are long and thick, and commonly called pigs. These are melted over again, and stirred with an Iron rod, in order to render them malleable. While they are yet red hot, they are placed under hammers, and by that means the heterogenous particles are forced away by the repeated strokes. However, one sort of Iron differs greatly from another; but that which is toughest is best; and that which is most brittle is worst of all. However, all sorts of Iron are of the same nature; and they are only more or less tough in proportion to the earthy, vitriolick and sulphureous particles mixed therewith. Iron being often melted and cleansed is turned into steel; though, in some, little labour is required for that purpose, and in others a great deal. When Iron is very good, they melt it in a furnace, and throw in gradually a mixture of equal parts of an alkalious salt, and filings of lead, with the raspings of oxes horns; then they stir the melted metal, and at length place it on the anvil, where they beat it into rods. Some Iron will not melt over again, and then they take Iron rods as thick as a man's finger, and place them in a proper earthen vessel, alternately with strata composed of equal parts of soot, powder of charcoal and raspings of oxes horns. When the vessel is full, they put a cover over it, and lute the joints, placing it in a reverberatory furnace; the fire is kindled, and increased by degrees, till the vessel is hot, and after six or seven hours, they let it go out of itself, in which time the rods will be turned into steel. When this operation is not perfectly performed, and only the outside of the Iron is turned into steel, in some parts of *England* it is called case-hardening, and this is commonly done with the leather of old shoes.

Iron is the hardest of all metals; but it will become harder still, if heated red hot and quenched immediately in cold water. The weight of Iron when compared with gold is a three to seven. Iron may be converted into rust by moistening it with water, letting it dry, and often repeating the same operation; but it may be preserved from rust by being smeared with

with fat. Iron calcined in a reverberatory fire, will turn into a darkish red, or purple calx; but being heated so hot as to be ready to melt, it will turn into scales under the hammer, which is nothing else but Iron half turned into glass. That part of the Iron which in furnaces is turned into a sort of glossy froth, is called the dross of Iron. This metal will dissolve in all sorts of acids; but alkalious Salts will not touch it. The filings of Iron being sprinkled on a candle will emit reddish sparkles; but if filings of Iron are thrown into a red hot crucible with nitre, they will soon bubble and send forth a fetid fume, till at length it deflagrates with a great flash. The filings of Iron thrown into spirit of Salt or Vitriol, will excite a violent effervescence, with a copious sulphureous fume, to which, if a lighted candle be held it will immediately flame, make a great noise, and break the vessel.

If Iron be held to the focus of a large burning glass, it will immediately emit copious fumes, and at length turn into a brittle blackish substance, half turned into glass; but if Iron placed upon charcoal be held to the focus, it will melt, and soon after turn into sparkles and fly away. The same thing will happen to Iron half vitrified when it is exposed to the rays of the sun upon charcoal; for it will obtain its former qualities, that is, it will shine, recover its ductility, and afterwards fly away in sparks. Hence it appears that Iron contains no small portion of a bituminous substance, which being joined to a vitriolic Salt, it is so detained by a vitrifiable metallick earth, that it will not without difficulty undergo a deflagration with nitre. It appears that Iron contains plenty of vitriolick salt, from its dissolving in simple water, as also from the taste of this water; as also from the heat of Iron filings sprinkled with water, which arises from the action of the salts upon the metallick earth. However, there is some difference between the sulphureous substance of charcoal and the sulphur of Iron; because Iron imbuted with the sulphur of charcoal, and placed in the focus of a burning glass, all flies away in sparks.

Iron is a most useful metal, not only on account of the various mechanical uses it is put to; but on account of the many medicines that this metal yields. Iron has two remarkable effects, namely, that of opening and binding; for it promotes the menses, opens the obstructions of the liver, spleen, and bowels, stops loosenesses and hæmorrhages, and restores relaxed fibres to their due tone. For medicinal purposes, Iron is better than steel; and the filings of Iron alone when ground small, is better than any other preparation of this metal whatever; the dose is from twelve grains to half a drachm, once or twice a day in the form of a bolus, pills, or lozenges.

COPPER is one of the more hard ignoble metals, and though 'tis hard, it is softer than iron; and, when polished is of a shining reddish colour. It will melt in the fire, and is so ductile that it may be beaten into exceeding thin leaves. It is more frequently found in its metalick form than iron, in various shapes; but its ore never distinguishes itself by any certain figure, for it is almost always irregular. But the finest colours of any kind except the red and transparent, most commonly betray the presence of Copper; for this reason there is hardly any Copper ore that is not mixed with Iron in a larger quantity than the ores of other metals commonly are. However, there is not so much in some as in others, and those that contain the least Iron, are naturally more easily melted than the rest. The vitrious Copper ore is of a darkish violet sky-colour, like that of a piece of steel that has touched a red hot iron. It is very heavy, and of a moderate hardness, but it is commonly variegated here and there with spots and grey veins. One hundred weight of this contains from fifty to eighty pounds of Copper. The Azure Copper ore is of a most beautiful blue colour, and is not soft, but very heavy, and when broken, shines like blue glass. This is most free from iron, arsenick, and sulphur; and a great quantity of excellent Copper may be extracted out of it with very great ease. The Green Copper ore is like green crystals, and sometimes very prettily streaked; but in other things

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it has the properties of the former. The light dusky blew concretes as well as the green, called by some Copper okers, yield a great deal of very good Copper when they are pure, which may be known from their colour and weight; but those that are more light are mixed with unmetallick earth, and those that are yellow, containing iron oker; on which account they are the more difficult to be met with, and yield less Copper of an inferior sort.

The white Copper ore has been hitherto found only in one single mine of *Misnia*, and it is distinguished from the white pyrites by a somewhat yellowish colour; but the grey and the dark ash-coloured, by the deepness of the colour, as also by the greater weight and breaking smoother. There is also a Copper ore called by some vitrean, which is not very different from the vitrious Copper ore, only it is mixed with a larger quantity of iron, on which account it is harder than the former and of a darker colour; it melts with greater difficulty than the foregoing, and yet is very rich in Copper. There is also a dark red ore almost of a livid colour, which appears at first sight like iron ore, this likewise melts with greater difficulty than others, but is very rich in Copper.

The Sulphureous Copper pyrites is of a yellowish gold colour, with a light tinge of green, both within and without. When broken, the inside has a kind of granulated surface, and it is easily beaten into powder. It contains sulphur and Copper in many different proportions; on which account its specific weight, varies very much. If it is very rich in Copper, and at the same time is mixed with any quantity of arsenick, its gold colour becomes more yellow, and when it is broken, the surfaces are more smooth, neat and even. It is very often of a very bright green, and blue on the outside, and between the chinks; yet when it is broken it appears of a different colour; but when the Copper pyrites is mixed with a considerable quantity of arsenick, it will then look pale like the sulphureous Copper pyrites; and still whiter when there is more arsenick. However, it may be easily distinguished

guished from the iron pyrites in being more heavy, and in not sparkling so easily when struck with a steel. The yellow sulphureous iron pyrites belongs to this class, because it often contains a great deal of Copper, which may be known from its not being of a globular figure, for when it is in that form it is always destitute of Copper; there is likewise an unusual yellowish colour throughout its whole substance.

Copper is seldom found alone in its ore, for there are other metals along with it, as silver, iron, and lead; there is also a large quantity, generally speaking, of a cumbustible sulphur, not easily separated from it. That which abounds with most sulphur, must undergo different calcinations till all the sulphur is exhaled, and this the workmen call roasting. After this the roasted ore is beaten into smaller pieces and calcined again, then it is beaten very small, and must undergo a third roasting, after which it will melt into a stony red substance, which is called the stone of Copper. This done it must be roasted again, and then melted, when it will yield a black Copper. It must yet be roasted eight times, and then it will be thoroughly cleansed from all the sulphur, but as it contains silver, this may be obtained from it in the following manner. It is to be mixed with about four times the quantity of lead, and melted with an intense heat, and then poured into moulds. These metallick masses are to be placed in a furnace, which is called a separating furnace, and two stones half an inch distant from each other, on which coals being laid in such a quantity as to keep up a moderate fire, so as to melt the lead united to the silver, which will separate from the Copper, and run into a coppel placed for that purpose. The Copper will remain in the furnace unmelted under the form of a spongy mass without silver, which by due management may be brought into malleable Copper fit for use.

There is a sort of Copper springs, out of which vitriol is made by boiling, and Copper may be extracted by precipitation, with the assistance of iron. There is one of this kind found near the town, called *Smalnick*, not far from mount *Krapack* in *Hungary*, in which

which there is Copper that will stick to iron when thrown into it; thus for instance, if you throw a horse-shoe into this spring, after a few days it may be taken out covered all over with Copper. There are Copper mines in various parts of the world, but the best and richest are in *Sweden* and *Germany*.

Copper is softer than iron, but harder than lead and tin; and it will grow red-hot before it is melted. Its weight, with respect to gold, is a little more than four to nine; and if it be exposed to a moist air, it will contract a green rust. It has a disagreeable smell, and an austere acrid nauseous taste; it will, in time, dissolve in water, as well as in oil, and salts of all kinds will corrode it. The solution of Copper in acid salts, and alkaline fixed salts is green; but in those that are urinous it turns to a most beautiful blue colour. The filings of Copper sprinkled in the flame of a candle will not sparkle, but turns the flame to a greenish colour; being melted with nitre, it flashes a very little. Take of filings of Copper one part, corrosive sublimate two parts, mix them together and distil them in a glass retort: The quicksilver will rise from the salts in the form of running mercury; and at the bottom the copperas will remain intimately mixed with the salts, under the form of yellow or red rosin, sometimes transparent, and sometimes opaque, which held to the flame of a candle, will melt, kindle, and emit a green flame. Copper calcined some time in the fire, and deprived of its sulphur, will turn into reddish ashes; which being applied a while to the focus of a large burning-glass upon a tile, will turn into a deep red, and almost opaque glass; but if this glass is held to the focus on charcoal, it will obtain a new sulphur, and turn into Copper again. Hence we may conclude, that Copper contains a portion of combustible sulphur, though not so much as iron, with a metallick red earth that will turn into glass. Copper will turn white with the fumes of arsenick or quicksilver; but it will not continue long. Being melted with lapis caliminaris, or zinc, it will turn of a yellow or gold colour, which is called brass. Copper, on account of its ductility, is formed into various household

utenfils, and is melted into mortars, great guns, and the like; but it is feldom used in phyfick, especially internally, becaufe it is of a poifonous nature; for which reason it is not fafe to use it in pots, kettles, and the like, without tinning.

Verdigreafe is the principal preparation, and is of great ufe to painters and dyers, but it is feldom or never given inwardly by phyficians; however, it is used externally to cleanfe and dry ulcers, and to eat away proud flefh, when made into an ointment, called the *Egyptian* ointment.

SILVER is a noble and perfect metal, of a white fhining colour, fonorous and ductile, but not fo perfect as gold. It is fometimes found in fmall mafses of many different fapes, but moft commonly like filaments and fcales in feveral forts of ftones and earths, and in many forts of land.

The *Vitrean* Silver ore, is of an irregular and uncertain form, it is very weighty, and may be eafily flatted with a hammer; for it is not much harder than lead, and is much of the fame colour; for which reason it is often miftaken for lead. It melts prefently and foon grows red-hot. It confifts of fulphur, and pure Silver, and above three quarters of it is Silver. The *Horny* Silver ore is half transparent, and is of a deeper yellow or brown colour, according, as it confifts of larger or fmallier lumps. It looks like rofin, and is of an irregular fhape. When carefully examined, it appears to confift of very thin plates; it is not very weighty or hard, for it may be eafily ground; and when brought fuddenly to the fire, it crackles, burfts, and exhales a fulphureous fmell, and fometimes burns lightly. This hard fort contains two thirds of Silver. The red Silver ore is fometimes of a lighter, and fometimes of a deeper fcarlet colour; the firft cafe is transparent like a garnet, and has been miftaken for transparent cinnabar; and in the fecond cafe it is of a deeper dye. It is heavier than the former horny ore, but burfts when brought near a candle or a mild fire, and the remaining part melts before it grows red-hot; and then it emits a difagreeable fmell

smell of arsenick, together with a thick smoke. It contains the same quantity of Silver as the horny ore just mentioned.

The White Silver ore is of a light grey colour of an irregular figure, pretty weighty, and very brittle. It has not only copper in it, but sometimes more of it than of Silver; for it differs from the white copper ore in nothing but in the quantity of Silver it contains. These are the principal Silver ores hitherto known, though many others are looked upon, by some, as such, because they contain a considerable quantity of Silver; but then there is always more of other metals along with them, and therefore they cannot properly be called Silver ores.

There are mines of Silver in many countries, as in *Italy, Germany, Hungary, Norway and England*; but the most remarkable are those of *Peru and Mexico*. In *England* the veins of lead always contain a small quantity of Silver, particularly that in *Cardiganshire*, already mentioned. Silver may be easily extracted from lead, by melting it in channels, made with ashes in the furnace, and then blowing up the fire with bellows, till it turns into glass, sinks into the channels, and leaves the pure Silver behind.

The manner of separating Silver from copper has been already mentioned; but if it contains but a small portion of copper, it is done by melting it in a crucible, composed of burnt bones, deprived of their salts. These ashes are to be kneaded with water, formed into a coppel and dried. Then it is to be placed in a furnace among the coals, and four or five parts of lead are to be melted, which done, the Silver that is to be purified is thrown in, that is, one part to four. When both the metals are melted, the fire is to be increased till the lead turns into glass, and by the constant blowing of the bellows, it will be driven to the sides of the coppel, where it will be absorbed into its pores, at least the greatest part; while the rest flies away under the form of smoke; so that nothing but shining pure Silver will remain in the coppel.

When Gold is mixed with Silver, another method must be used for their separation. If there is a great

deal of gold, then so much Silver is to be added, as to make the quantity four times as much as the gold, then they must be melted together, and the mixture be dissolved in aqua fortis, which will only fix upon the Silver, and leave the gold untouched in the form of a powder, or black mud, which when the solution is poured off must be washed several times, and at last melted. The Silver may be precipitated by pouring a large quantity of common Water on the solution, and then throwing copper-plates into the liquor. The Silver will adhere to the copper-plates like an ash-coloured powder, which being dried, may be melted into Silver again.

Silver is harder than gold, but not so ductile, and it is lighter than gold and lead, the weight, with regard to gold, being little less than five to nine. It will not rust, but it will grow black by sulphureous vapours; and it will dissolve in aqua fortis, but not in aqua regia. When exposed to the focus of a large burning-glass, as well upon a tile, as coals, it will all fly away in smoke, but very slowly, and will not turn into glass like other metals. When it is mixed with common salt, and melted, it turns into a half transparent mass like horn, which is hard to be brought back to Silver again, because it is volatile, and in a violent fire will all fly away. When Silver is dissolved in aqua fortis it may be crystalized; and the crystals are very corrosive, and of an exceeding bitter taste; when applied to the skin, they leave an impression like that of a burning coal, and make an eschar of a black colour. The solution of Silver will turn any thing black, and therefore after it is properly diluted it is often used to colour the hair. These crystals will melt in a very moderate heat before they grow red, and form a blackish mass; it is then proper for the use of surgeons, and is called the Silver caustick.

GOLD the heaviest and most noble of all metals, is extremely ductile, and of a shining yellow colour. It is often found native, as it is called, but of no distinct figure, consisting only of small irregular masses. But there is a flint, or white quartz in which Gold is commonly contained in very large solid masses. It is likewise

likewise concealed, but not so often, nor in so large a quantity in a yellow and blue sort of stone, which some call the horny stone. Lapis Lazuli is a blue stone, and is often very elegantly variegated with very small specks of Gold; however, the quantity is not so large as in the former. Many sort of gravels and earths often contain Gold; but they are seldom rich enough to pay the charges of extracting it. However, that kind of gravel which is found in the channels of rivers and brooks, especially when they wind and turn very much, is richer in Gold than the rest. It has been found in the rivers of *Scotland*, of which medals have been made, especially at the time of the coronation of king *Charles I.*

Native Gold is not always found pure, for it is often mixed with silver; and there has been no ore hitherto found, in which Gold constituted the greatest metallick part; so that no ore whatever, can be properly called golden ore. However, there are Gold mines in *Norway*, *Hungary* and *Guinea*; but the richest of all are in *Mexico* and *Peru*. It is extracted from the substances in which it is contained, by roasting, pounding, washing, and mixing them with quick-silver. When it is found among ignoble metals, it is freed from them in the coppel by the means of lead; but if it be mixed with silver, it is separated from it by the method already mentioned. However, Gold reduced into thin plates, may be put into a crucible with cementing powder, placing one layer upon another alternately; but the uppermost, and lowest layer must always be powder. When the crucible is full, it must be closed with a thin cover, having a hole in it, and the joints must be luted; then the crucible must be placed in the fire for six or eight hours till it turns whitish with the heat. When the fire is out the gold plates are to be brushed with a hare's foot, washed and dried. The cementing powder is made with one part of sal armoniac, two of common salt, and four of bricks, all made into a fine powder, and well mixed together. However, this does not entirely free it from other metals, but renders it more soft and ductile. When there is a small quantity of silver

mixed with Gold; that is, so small, as not to be worth preserving, it is melted with three or four parts of antimony in a coppel, blowing gently with a pair of bellows, till the antimony flies quite away, leaving the pure Gold behind.

Gold is not only the heaviest of all metals, but of all other substances yet known. It will not change with common fire, nor will it fly away in the focus of a large burning-glass, till it has continued there a long while. It will not rust, nor will it dissolve in any other menstruum, except aqua regia. It will mix readily with quick-silver, and turn into a soft amalgama. It may be calcined with common sulphur when it is made glowing hot, and held thereto. When Gold is dissolved in aqua regia, and oil of tartar poured thereon, it will precipitate into a brown powder, which if heated at the fire, or lightly ground, it will fly up with a great explosion and noise, from whence it is called fulminating Gold. All attempts to analyze this metal have hitherto been in vain. As for the use of gold in physick, notwithstanding the boasting of former chymists it is little or none at all; for all its preparations have been hitherto found rather noxious than otherwise.



C H A P. XIX.

Of G E M S of all Kinds.

OF all the Transparent Gems, the DIAMOND is the hardest, the most beautiful and valuable. The best are those that are void of all colour, for if they are tinged with white, yellow or black, they are in some degree faulty, and considerably lower in price. It may be readily distinguished from all other Gems by its extreme lustre and sparkling, as well as the brightness of its reflections. If a little burnt ivory be laid upon mastick, in such a manner, as to render it black, and the diamond be laid upon it, it will then reflect the most lively colours every way, which
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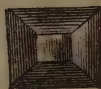
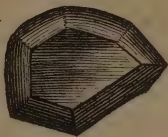
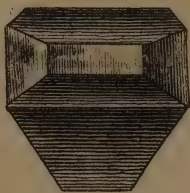
is a property belonging to this Gem, for all others will not bear the like trial; for when they are laid upon the mastick in this manner, they either reflect no colours at all, or, if they do, they seem to be seen through a mist. There have been jewellers, who designing to make other stones appear like diamonds, have taken a grain of wheat, and have pressed the oil out of it with a hot iron, and then they have mixed it with lamp-black, or burnt ivory, and then have put it under the stone; but so as to leave a little room between it and the black tincture. Then the transparency, which is partly owing to the stone, and partly to the air, causes it in some degree to resemble a true diamond, insomuch, that some, who are skillful in these matters, have been deceived thereby.

Those Gems that are most proper to counterfeit diamonds are the saphire, the oriental amethyst, the topaz, and the chrysolite, because they are all hard, transparent, and may be deprived of their colour, by means of fire; but this is most commonly done with quick lime, or the filings of steel; for when the Gem is buried in these, and put into a crucible with charcoal, it is put over the fire, and gently heated at first, and when the heat is encreased the colour will vanish. When it has been in a sufficient time, they let the fire out by degrees, and do not take the stone out till it becomes lukewarm. If it is not entirely deprived of its colour, they repeat the operation, as before; for if it was to be heated suddenly, or when hot, immediately exposed to the cold air, it would certainly crack, or perhaps break entirely. A topaz is more fit for this purpose than an amethyst, for this has been managed so artfully, that it could scarcely be distinguish from a diamond by the best judges.

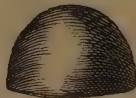
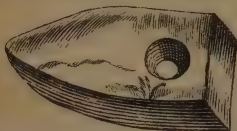
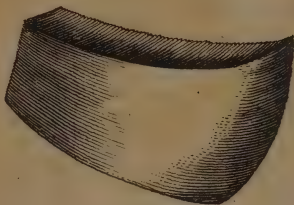
According to *Pliny*, there are six sorts of diamonds, as the *Indian*, or oriental, that has six angles, and terminates in a point almost like a top, and is about the size of a hazel nut. That of *Arabia* is like it, but less; as he pretends it cannot be broken with a large hammer, when placed on an anvil. The third sort he calls *cenchron*, of the size of a millet seed. The fourth

was from *Macedonia*, of the size of a cucumber seed ; and was found in a piece of gold coin. The fifth is the *Cyprian*, and, as he says, is a very efficacious medicine ; and the sixth is the *Siderites* ; this shines like polished steel, and is heavier than the rest, but is of a different nature, because it may be broken with a hammer, as well as the *Cyprian*, though it is heavier than any other. But these kinds are now entirely unknown ; for we have but one sort of diamond, unless those that are faulty, may be said to be of different kinds. They sometimes receive their names from the places where they are found, as the *Hungarian*, *Bohemian*, and the like. Among these there are two differences worth observation, for some are found in the form of hexagons, and others almost round ; but they differ greatly in hardness ; for those that have angles are softer, and are little better than crystal, as the *Hungarian* ; those that are round, and in some sense resemble flints, are by much the hardest, and come pretty near the lustre and sparkling of oriental diamonds ; but as they will not stand the trial of the mastic above-mentioned, they cannot properly be called diamonds. The oriental diamonds are distinguished from the places where they are found, for some of these are denominated from the old mines, and others from the new. However, they are not all equally hard, nor of the same colour, but they will stand the test of the mastic ; and the harder they are the more they sparkle. Diamonds are not weighed like gold, but by carats, each carat consisting of four grains ; and it has been said, that there was one found in *Bisnagar*, that weighed an hundred and forty carats, that is, five hundred and sixty grains ; it has also been reported, there was one met with that weighed two hundred and fifty carats, and was of the size of a pullet's egg : Likewise *Tavernier* affirms, that one belonging to the great *Mogul* weighed two hundred and seventy nine carats. However, the largest now known in *Europe*, is one that belongs to the great duke of *Tuscany*, which weighs an hundred thirty nine carats and a half ; and that in the possession

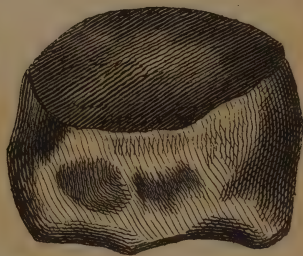
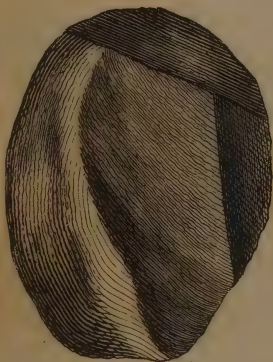
Diamonds



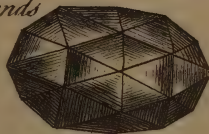
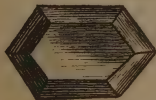
Ruby.



Rough Diamonds



Polished Diamonds



possession of the king of *France*, which is equal to an hundred and six carats.

Diamonds are of such a nature that no fire will injure them, for when they have remained in one for several days, they rather come out with a more perfect lustre than otherwise. It has been said, as was observed above, that a diamond would bear the stroke of the largest hammer; but this is not true, for by this means it may be broken to powder. Some have related, that a diamond will deprive a load-stone of its polarity; but this has been found false by many experiments. Diamonds have been said to have been a preservative against poison, the plague, witchcraft, charms, madness, vain fears, and terrible dreams, and many other dreadful disorders, but this is well known now to be entirely false.

The value of a Diamond arises partly from its sparkling and reflections, for it will imitate all the colours of the rainbow; and partly from its hardness, from whence it may be said to be almost incorruptible; However, *Andreas Baccius* affirms, that a Diamond may be spoiled by heat, and therefore he advises those that would preserve their colour and splendour to put off their rings at night when they go to bed. Diamonds were formerly worn by kings, and other great persons only; but now they are very common, and may be easily purchased by people in moderate circumstances. A well polished Diamond, formerly of the weight of a pepper-corn was sold for fifty shillings, but now it is not worth above two. A cut Diamond, weighing a carat, or four grains, has been valued at upwards of ten pounds; but now the price is extremely fallen. It has been said, that the value of a Diamond encreases in proportion to the square of its weight; thus, if it weighs two grains, multiplied two into itself, which will produce four; which being multiplied by the price of one grain, which we will suppose to be ten shillings, and then it will amount to forty, which is the price of a Diamond that weighs two grains, but this rule will not now hold good.

With regard to the use of a Diamond, it not only serves for ornament, but when reduced to powder, is extremely

extremely serviceable for polishing and cutting all other Gems whatever; and it is well known that Diamonds themselves cannot be properly polished without it.

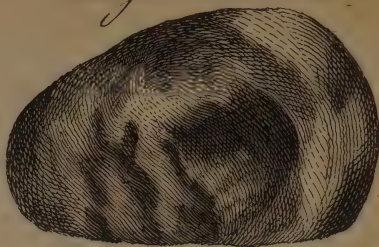
A Diamond seems to consist of several plates, laid one against another; for which reason, a skilful lapidary, with the point of a knife, can divide one into two or more tables. If one be placed in the focus of a burning-glass with its plates perpendicular to the rays of the sun, it will receive no detriment; but if it be turned the other way, the rays will get between the plates, divide them, and afterwards turn them into a glassy substance, leaving not the least sign of the splendor of a Diamond.

The places from which Diamonds are brought, are the island of *Borneo*, and the kingdoms of *Visapour*, *Golconda*, and *Bengal* in the *East-Indies*, as well as from *Brazil* in *South America*.

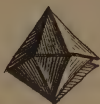
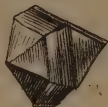
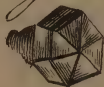
Tavernier, who travelled to the *East-Indies*, chiefly for the sake of Diamonds, visited the places where they are chiefly to be found, in order to get the best knowledge of them he could. The first mine that he saw, was at a place called *Carnatica*, in the dominions of the king of *Visapour*, and at a place called *Raolconda*, five days journey from *Golconda*. This was found out about three hundred years ago; and about the place where the Diamonds are met with, the ground is sandy, and full of rocks and low trees. In these rocks there are several veins, sometimes half an inch, and sometimes an inch broad. The miners have small pieces of iron, crooked at the end, which they thrust into the veins to draw out the sand or the earth, which they put into vessels; and it is among this earth that they find the Diamonds. But as these veins are not always strait, but sometimes ascend, and sometimes descend, they are obliged to break the rock to follow the course of the veins. After they have opened, and gathered as much sand as they can out of the veins, they wash it two or three times, in order to discover whether there are any Diamonds among it or not. This mine yields Diamonds of a very fine water; but they are often flawed by the bad management of their hammers in breaking the rocks to pieces.

If

Rough Diamond



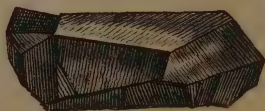
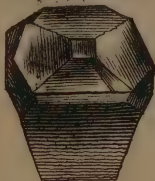
Crystals



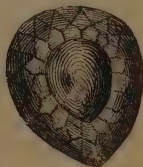
Rough Ruby



Diamonds



Diamond



If the Diamond is good, they only polish the surface a little, because they are afraid of bringing it to a proper form that would lessen its weight. But if there be the least flaw or foulness, they give it variety of faces, or sides, in order to hide the defect. However, it is observable, that they had rather see a black speck in a stone than a red; and therefore, when there is one that is red they put it into the fire, and then it becomes black. There are several men here, whose employment is to polish the Diamonds, and they have each but one wheel, which is made of steel, and about the diameter of a pewter plate. They apply but one stone at a time to the wheel, and they sprinkle it with water constantly, till they have found out the way in which it will best work. This being found, they take oil and the powder of Diamonds, which they never spare, because it is cheap here, that they may polish the Diamond the sooner. There is always a little boy who continually supplies the wheel with oil and powder of Diamonds. However, they cannot polish the stones so well as the lapidaries in *Europe*, because as it is necessary to keep the steel rough by applying emery, or by filing it, they are too lazy to do it so often as they ought, and consequently the wheel will not perform the work so well, nor so soon, as those in this part of the world where they take more pains.

The CARBUNCLE is a stone of a very deep red, with a mixture of scarlet, and has been formerly thought to shine in the dark like a lighted coal; but this is now known to be otherwise. It was called by the ancients *Anthrax*, but they have given such a confused description of it, that *Boet* is of opinion, that no particular stone was meant by that name; and even our lapidaries, at this time, are acquainted with it by no peculiar name. It is said to be as hard as a sapphire, and to be found naturally of an angular figure, or smaller at one end than the other. However, as it is very uncommon, there needs no more to be said about it.

The RUBY is a transparent gem of a reddish colour, with a small portion of blue, and cannot be touched by a file. The redness is not like that of vermillion,

vermillion but of blood, or rather of cochineal, or kermes; but the less blue it has in it, the better it is. There are commonly said to be four kinds, the Rubycell, the Balass and Spinel Ruby, which with the true Ruby make up the number; and the best are found in the island of *Ceylon*. In *Pegu* they are found in a river of that name, and the inhabitants try their goodness with their teeth and tongue, for they judge those that are coldest and hardest are the best. They are said to mend the colour by the assistance of fire. They are usually met with in a stony matrix of a rose colour, and if they meet with one that is transparent, they then call it a Balass Ruby; but if it is otherwise, and has no resemblance of a gem, it is then the true matrix of Rubies, because it is formed, nourished, and increases therein. At first it is whitish and assumes a red colour, as it ripens. It is generally found in the same mines with sapphires, and some of them are pretty large; for the Emperor *Rodolphus* had one that was as large as a small pullet's egg, and this was thought to be the largest that was ever seen in *Europe*. It has been said to have much the same virtues as Diamonds, and has been looked upon as a great preservative against the plague; besides which, it had according to some, the peculiar property of changing colour, when any misfortune was to happen, and one in particular, tells us a grave story of one that had a very fine stone, which almost lost its colour before the death of his wife; however, after her death, it re-assumed its former splendor again; but it must not be forgot, that this Ruby was set in a ring, which was formerly given him by his wife.

When the value of a Ruby exceeds ten carats, it is thought to be very great, and is not exceeded by a Diamond. When a Ruby is deficient in its colour, that is, when it is not so red as it ought to be, some lapidaries endeavour to mend it, by putting a red foil under it, or glass of a beautiful red colour. Some have attempted to counterfeit a Ruby, with stones of a whitish colour, as a white sapphire, topaz, or crystal, by the assistance of a red foil, for then it will sparkle and seem to differ very little from a true Ruby; how-

ever

ever, those that have judgment in stones will very easily distinguish it. Others endeavour to counterfeit Rubies with orpiment, which they put in a glass vessel not exactly stopped, over a slow fire, and then the orpiment will sublime, and stick to the sides and neck of the vessel; this matter will grow bigger and bigger by degrees; and that at the top will grow thicker, and gather as it were into bubbles, which at last grow so large that some of them will fall down, and others will stick to the neck of the glass; but they will all be of a glorious Ruby colour, but small and brittle; then they break the glass and take the bubbles for use. But to make them larger, they lay many together upon a piece of glass, and melt them, and they will run into one mass of as fine a colour as before.

The BALAS RUBY is the matrix of the true Ruby before described, and is supposed to have its name, from its being the house or palace thereof, for by some authors it is called palafs on that account. This Ruby is of the colour of crimson, for it has a very little mixture of blue, and when it is polished, it is a very agreeable gem, and will sparkle almost as much as a true Ruby. It is found in veins of saphire, and is to be met with in the same places as the other; though it is not so valuable by far. It may be adulterated like the true Ruby, and the fraud will not be so easily discovered.

The SPINEL RUBY is of a deeper colour than the true, but it has not the splendor, for which reason it is more easily adulterated. However, there are some so good as to come very near the value of the true Ruby, especially those that are said to be of the old rock, and are about half the value of Diamonds. The RUBYCELL is a gem that seems to be between the Spinel and the Hyacinth, insomuch, that it is hard to say to which class it properly belongs. Likewise they are sometimes exceedingly like *Bohemian* Garnets, and are not known from them till an experiment is made in the fire; for these will bear it without the least loss of colour, whereas the Rubycell will either lose or change it. They are not near so valuable as the Balafs or Spinel.

The GARNETS have by some been taken to be carbuncles, for when exposed to the sun, it will shine like a lighted coal, and much better than a ruby. They are brought from the *East* and *West Indies*, and from *Ethiopia*, where they are of three kinds; for some are darker than the rest, being of a blackish blood colour, and yet they will sparkle indifferently well. When a white foil is placed under them, they are of such a fiery colour, that some have mistaken them for true carbuncles. Many of these are large, some having been found bigger than a hen's egg. Another sort is of the colour of a hyacinth, and if it was not for being redder, it might be taken for a true gem of that kind. When it has a yellowish tinge it may be placed among the class of hyacinths, and will be that stone called in *Italy* *Jacinta la Bella*. These sometimes resemble other gems so much, that even the lapidaries themselves are not certain what they are. Another sort of Garnets are of a violet colour mixed with red, and these are better than the former, inasmuch, that they are called by the *Italians* *Rock-Rubies*.

The OCCIDENTAL GARNETS are often of a fainter colour, and particularly the *Spanish*, inasmuch, that they appear like a pomgranate seed, and are pretty large. Some are of a yellowish red, and will not change in the fire, particularly the *Bohemian*, and they are all free from flaws. These are more valuable than the oriental, on account of their resisting fire; and they resemble real carbuncles. These are found in the fields almost every where by the country people, without any matrix; they are generally of the size of peas, and are carried to *Prague* to be sold. At first they are so black on the outside that no redness can be perceived, till they are held up to the light. Others are found in *Silesia*, but these are rough, and generally full of flaws, inasmuch, that they are seldom transparent. If a Garnet be exposed to the focus of a large burning-glass, upon charcoal, it will be reduced to a metallick mass of the nature of iron, for it may be attracted by a loadstone. Garnets were formerly worn as Amulets; or they were reduced to
powder

powder and drank, for they were thought to resist sadness, and to cheer the heart; but some of the ancients were afraid of its fiery nature, and thought that they hurt the brain, heated the blood, and provoked anger. The moderns affirm, they are of an alkaline nature, but as they evidently partake of iron, they must certainly have the properties of that metal, though it is not worth while to make use of them in medicine, because iron itself is so very cheap. Those Garnets that are large bear a considerable price; but as for the small they are exceeding plenty, and therefore very cheap; but this must be understood of the *Bohemian*, for the oriental, though large, are not in high esteem. They sell the *Bohemian* Garnets by the pound, and the price is always proportionable to the size.

The HYACINTH is so called, from its being of the colour of a flower of that name, which is of a yellowish red. There are four kinds, as being of so many different colours; the first is as red as vermilion, and pretty nearly resemble *Bohemian* Garnets, but without any mixture of blackness. These are more valuable than the rest, and may be placed in the class of carbuncles. The second sort are of a reddish saffron colour; the third are like yellow amber, and could not be distinguished from it, unless by their hardness, and by their want of electricity. These are of little value, no more than the fourth sort, which look like white amber, and are worst of all. Some affirm, there is a fifth sort, whose colour is a mixture of fallow colour and blue; but these are very seldom, if at all to be found. The Hyacinth of *Pliny*, is now thought to be the Amethyst of the moderns; and the Amethysts of the ancients, are now called garnets. This gem is of various sizes, but is seldom larger than a nutmeg. It is found in the *East* and *West Indies*, as well as in *Silesia* and *Bohemia*.

The AMETHYST is a transparent gem, of a violet colour, arising from a mixture of red and blue. However, they are of different colours, for some, as the oriental, have a mixture of yellow, and some are purplish like red wine; but the best sort are those that shine

shine most like a carbuncle, and they are so hard that they may be turned into a sort of diamonds, so as to deceive the most skilful lapidaries. *Boet* affirms that he has seen one set in a gold ring which was sold for two hundred crowns; they may be converted into diamonds in the same manner as sapphires. They are found in *India*, *Arabia*, *Armenia*, *Ethiopia*, *Cyprus*, *Germany*, *Bohemia*, and *Misnia*; but as they are generally as soft as crystal, they are not in very great esteem. The oriental are hardest; if they are without spots they are of the greatest value. They are found of various sizes, and in various shapes, from the bigness of a small pea, to an inch and a half in diameter. They are adulterated with mastick tinged of a violet colour, placed between two crystals; but the *Germans* do not think it worth while to counterfeit them, because they are pretty common.

The SAPPHIRE is a hard gem of a blue or sky colour, is very transparent and sparkles very much; but some of them are whitish, and others of a deeper blue; and when they are destitute of all colours they are called white sapphires, and are so like diamonds that they may very well supply their place. They are either oriental or occidental, and the former are brought from *Calicut*, *Cananor*, *Bisnagor*, and *Ceylon*; but the best are found in the kingdom of *Pegu*. The occidental are found in various places, as in *Bohemia* and *Silesia*, where they are pretty good; though there are some that are soft, and almost of a milk white colour, with a small mixture of blue. It is very subject to flaws, and yet is so hard that a file will not touch it. The colour may readily be taken away by fire, and then it will be converted to a sort of a diamond, inso-much, that when it is set in a ring, it can hardly be known from one by a skilful lapidary. The value of a Sapphire is derived from its colour, purity, and magnitude; for if it has no flaw, and is of a deep colour, continuing transparent at the same time, it is then the best. It is said to have the same virtue as other precious stones; but in medicine it has, in reality, none at all. It has been common to counterfeit Sapphires with a bit of blue glass placed between two *Bohemian* diamonds. Some tinge glass of a blue colour,

colour, and sell it to ignorant people for a Sapphire. This may be done several ways; but the most common is to put a little zaffer or smalt into a glassy mass of crystals or flints; that is, two drams of zaffer to one pound of glass, and stirring them together, when melted, with an iron rod; then a little of it is taken out to try the colour, and to see if it wants any more zaffer or not. If it is right they continue it melting for six hours, and then take it from the fire. When this is rightly done, very few can distinguish it by sight from a true Sapphire. Sapphires are found in various sizes; but seldom so small as other gems, and yet never more than three quarters of an inch in diameter; but the usual size is between the sixth and the tenth of an inch. The shape is very uncertain; for it is sometimes in one form, and sometimes in another.

The OPAL is a most beautiful gem, for in different lights it shews all sorts of colours, as blue, purple, green, yellow, red, milk white, and black, which is occasioned by the different refraction of the rays of light. There are four kinds of this stone, the first of which is transparent, without any opacity, and yet reflects all the colours of the rainbow. Another sort is black, and yet sparkles so much that it appears like a carbuncle; but this is exceeding scarce and consequently highly valuable. *Boet* affirms he has seen one about the size of a pea, which was given him by a friend. The third species reflects various colours; but the yellow is predominant, and consequently this is not so valuable as the first sort. Almost all these are brought from *Hungary*, and are in very good esteem. To this kind may be referred the stone that is called by the *Italians* *Occhio del Gatto*, that is, the *Cat's Eye*, which is formed of the matrix of Opal; and is named by some the bastard Opal. The fourth sort is a bastard Opal, and is of the colour of the crystalline humour of the eyes of fish; for it is a little transparent, and is nearly of a blueish milk colour or yellowish; and when it is turned to the light it seems to shine at the farther edge, by means of the reflection of the light. It is
by

by some called an asterites, or the star stone, because within it may be seen a sort of a star, which changes its place as it is turned differently to the light.

The CATS-EYE, however, by most jewellers, is not placed among the opal kind; but is thought to be a peculiar gem, and therefore will require a more distinct consideration. The opals of the first and second kind are seldom to be met with very large; but they are of very great value, for one in the possession of a *Roman* senator was said to be worth twenty thousand ducats. Those of the third and fourth kind are sometimes met with pretty large; for one of these that reflected various colours was of the size of a walnut, and was valued at two hundred crowns. All sorts of opals are found in the *East-Indies*; but those of the ordinary sort are to be met with in *Cyprus*, *Egypt*, *Arabia*, *Natolia*, and *Hungary*; and in this last place some of the first sort have been found in opal stones, though very seldom. There have been also some lately found in *Denmark*, and they are all contained in a soft stone full of black, yellow, and fallow coloured veins. Opals have been said to have the virtues of all other gems; but they are now never used in physick. With regard to the value, it has been generally thought to equal that of sapphires. They cannot be counterfeited like other gems with a double glass, nor yet any other way, though *Quercetan* affirms he has seen a glass alembick so tinged with the spirit of nitre, that it appeared like a true opal.

The EMERALD is a green shining transparent gem, and has a very agreeable appearance. It is of two kinds, the oriental and occidental; the oriental are very hard, and of a meadow green colour, which never changes in any light. They are quite transparent, and are in very great esteem, they being of the very best kind. They are brought from the *East-Indies*, as well as *Tartary*, *Egypt*, and other countries at a great distance from thence; however, they are very scarce, and there are very few of this kind seen in *England*. But the *American* Emeralds are more common, and are found principally in *Peru* in
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the earth of the mountains. These are of a very pleasant green, though they are but dull in comparison of the former; for they are neither so transparent, nor so sparkling, nor yet so hard; and comparatively the value is but small, with regard to the former. The *European* are principally from *Silesia*, and there are coloured crystals found in *Germany*, that commonly go under the name of occidental Emeralds. The oriental are seldom met with above the size of a hazel nut. When an Emerald is put in the fire it kindles like brimstone, and the green colour flies off in a flame, after which it looks like a bit of crystal. Hence it appears that gems in general consist of two parts; namely the crystalline, which is fixed, and the sulphureous, that is volatile. Hence it appears that an Emerald is not quite destitute of medicinal virtues; for what is done in the fire, may, in some measure, be performed by the heat of the stomach, and by the digesting fluid; for though the crystalline part cannot be dissolved, yet the sulphureous may be separated from the crystalline, and act upon the humours of the human body. Perhaps it may be said that the metallick or sulphureous part is so small, that it can have but little virtue; but it must be considered that the energy of a medicine does not always consist in its bulk; for a very few particles of the glass of antimony will produce great alterations in the human body, as may be easily apprehended from the operation of emetick wine. However it must be acknowledged that the virtue of any sort of gem is not sufficiently apparent hitherto. And yet, Dr. *Toll*, a *Dutch* physician, affirms, there is no better remedy for an intermitting pulse than the powder of Emeralds, when given to the quantity of ten grains, in a spoonful of syrup. The best kind of Emeralds have always been in high esteem; but these are exceeding scarce, as has been observed; but the occidental being more common, and by far not so good, are of little value with respect to the former. An Emerald may be counterfeited various ways, but the best is by melted crystal glass, with a small addition of red lead. Some reduce burnt copper into a very
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fine powder, and then add half the weight of the saffron of iron, which they keep over the fire for the space of six hours, and then suffer the vessel to cool of itself. If this method be practised judiciously, counterfeit emeralds may be produced as good as those of *America*.

The PRASIUS or PRASSITE, is by many thought to be the matrix of an Emerald, and perhaps not improperly, because it is sometimes found within it; for the greener parts that are transparent, and without any mixture of yellow, may be properly called Emeralds; and those that are of a golden yellow colour, may have the name of Chrysoprassites. The colour of this gem is like that of a leek, or a colour that is made with a mixture of yellow and green. It is but semi-transparent, on account of the clouds that are visible in it; and sometimes it has a mixture of red, white, or black, according to the various stones to which it has been formed, such as jasper, crystal, and the like. There is one sort altogether green, another more yellow like dried fern, and a third is very little green, with a great deal of whitish yellow. This last kind is semi-transparent, and ought rather to be placed among the nephritick stones. This gem is very common, and so large, that statues have been made therewith, and therefore it can be of little value. As for its medicinal virtues, it is said to possess the same as those of an Emerald. The Chrysoprassius is nothing more than a Prassite, that has the colour of gold mixed with the greenness of a leek, and it looks very prettily, though it is not of much value.

The SMARAGDOPRASIUS is a gem between a Prassite and an Emerald; and is of a grass green colour, without the least yellowness in it; but it is not so green as an emerald. It is sometimes, though very seldom, almost transparent, and it is called by some a bastard emerald. These stones are found in *Bohemia* and the *West Indies*. The *Bohemian* is generally opaque, and nearly resembles *Roman vitriol*. These are said to be the stones that the native *Americans* near the river of the *Amazons* wear in holes of their lips, in pieces about

about the length of a man's finger. Some take this to be the true nephritick stone; but this is doubtful, as well as its virtues.

The CHRYSOLITE, is the topaz of the ancients, and is a transparent gem, shining with the colour of gold. It is of a fainter green than the emerald, and is somewhat of a yellowish tinge. Some take it to be the matrix of the emerald, and by many it is confounded with a chrysoprasius. This stone will not stand the test of the file, and sometimes there are such large pieces of it that statues may be made therewith. The topaz of the shops is the Chrysolite of the ancients, and is a transparent stone of a shining gold colour without any mixture. It is of two kinds, the oriental and the *European*; the first of which shines like pure gold. The *European* are as soft as crystal, and having a mixture of blackness with the gold colour; and there is sometimes so much of it, and so little of the yellow, that if it was not for the blackness, it could not be distinguished from crystal. Sometimes pieces of these have been found to weigh twelve pounds, and there was one brought from *Bohemia* that was two ells in length, and near half an ell broad. These stones may be counterfeited in the same manner as the rest; but the best way is to put a quarter of an ounce of saffron of iron, and a little red lead into a pound of melted crystal glass, or if one part of calcined crystal be added to three of lead, and they are kept for a whole day in a furnace, a topaz will be formed without any other addition.

The BERILL is a gem of a blueish green like sea water, for which reason it is called by the *Italians* *Aqua Marina*. When it has rays of a gold colour, or the sparkles are of that colour, it is called a Chrysoberill, and some place it in the same class as the chrysoprasius. All these stones are transparent, and have but a faintish colour, for when this is more deep, they are taken for other gems. It is found of various sizes and of different shapes that are seldom more than a third of an inch in diameter; and the value is always in proportion to the fineness of the colour. It may

may be counterfeited by reducing burnt copper to an impalpable powder, and melting it with crystalline glass or calcined crystal, in the proportion of one dram to a pound of a glass.

The ASTERIA called by the *Italians* Girasole, is a sort of an opal, only it is harder, and consequently may be placed by itself; especially as it may be distinguished from an opal very easily. The harder it is the better it reflects the image of the sun, and so agreeably, that it is by some called the gem of the sun. This stone is transparent like crystal, but much harder. It has been named by some the cats eye, because the sparkling is sometimes greater and sometimes less. It differs from the eyes of *Belus* termed by the *Italians* Bellocchio, because it exactly imitates the iris of the eye and pupil. *Pliny* says, it is particularly remarkable for having a kind of light therein, such as is seen in the pupil of the eye, and when the position is changed, it seems to wander from one part to another. It is hard to be engraved, and that is the best that is found in *Carimania*, which is whitish; for that of the *East Indies* called Astrios though whitish likewise, does not reflect sun-beams so powerfully; however, it shines like a star at the time of the full moon. The worst kind is called Ceraunia, for it has the only glimmering light of a candle in a lanthorn. It is hard to say what *Pliny* means by this account; for the true Asteria appears like a whitish crystal, having within it round spots of light, which in different positions changes their place. It may be distinguished from the astroites, because that gives the representation of stars, and is a kind of opal. Specimens of this have been taken from the matrix of opal, and when exposed to the sun, they emit sparkles like so many small stars.

The Cats Eye is the Astroites of *Pliny*, and is the same that is called by some the Eye of the Sun, and by the *Persians* Mithrax, which signifies the sun. *Cardan* names it a bastard Opal, because it reflects various colours, though not so distinct as the true opal, and it is likewise harder than that. It also differs from
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another gem by some termed the Cat's Eye, and the Eye of *Belus*, which is a kind of agate or onyx. The best are found in the island of *Ceylon*, and sometimes they are brought from *Pegu*. It is much esteemed in the *East Indies*, where it bears a good price, though not so much as an opal.

We now come to the semi-transparent stones, among which the SARDIUS or CORNELIAN is reckoned the chief. By some it is called the Carnelian, because it is of the colour of raw flesh, for *Caro* is Latin for flesh. However, it is more of the colour of bilious blood. It is semi-transparent like the washings of flesh, and is called by *Pliny* *Sarda*. It was in common use among the ancients, especially for seals, as it is at present. It was first found by the inhabitants of *Sardis*, a town of *Lydia* in *Asia Minor*, and from thence was carried to *Rome*; but there was a very good kind found near *Babylon* in the heart of a stone. There are three kinds of it; namely, the red, the demium (which looks duller or fatter than the former) and that which seems to have a mixture of silver films. Those of the *East Indies* are most transparent; and the thicker or fatter sort is brought from *Arabia*. It is also found in the *West Indies*, as well as *Silesia*, *Bohemia*, and many other places. *Albertus Magnus* distinguishes the *Sarda* from the *Cornelian*; but it is in reality the same gem, unless the name of *Sarda* may more properly be given to the white *Cornelian*. However, there are three kinds of *Cornelians*, the first of which is the red, now taken notice of. The second is of a faint blood-colour, and semi-transparent; and the third is of a yellowish red. *Boet* affirms the best *Cornelians* are found in *Sardinia*, and that those of *Epirus* and *Egypt* are the next in value; but those of *Babylonia* are preferred by some to all others. It is usually found in other stones. It was formerly in high esteem; but since other and better gems are more common, it is of little value; being chiefly made use of for seals, as was above hinted.

The SARDONYX seems to be of a middle nature, between the *cornelian* and the *onyx*, which its name seems plainly to imply. It is generally tinged with white, black, and blood-colour, which are distinguished

from each other by circles or rows, so distinct that they appear to be the effect of art. There are many kinds, and great diversity in the colour of these stones; but the greater variety there is of these last, the more they are valued. There are sometimes purple, blue, rose-coloured, and yellow circles, whose ground is black, especially the *Arabian*; for in the *East Indies* it is of the colour of horn. When the circles are not distinct, but as it were separated, and of the colour of honey, they are of no great value. *Boet* thinks the Myrrhine vessels, so much cried up among the *Romans*, were made of this stone, because he had seen parts of cups made of a Sardonyx, which were very ancient, and which had all the colours of a rain-bow. The best sort is brought from the *East Indies*, and the next to that is the *Arabian*. It is found also in *Germany*, *Bohemia*, *Silesia*, and the neighbouring countries; but it is seldom clear, nor are the circles distinct like those of the *East Indies*. There are pieces of the Sardonyx found so large, that drinking vessels may be made therewith. This stone was formerly given in powder for the stopping of blood; but now it is quite out of use.

The CHALCEDONY is placed by *Pliny* in the class of rubies of a darker aspect, and yet paler than a carbuncle; but this is evidently the characteristic of a garnet. This gem is generally of the same colour throughout; though it is sometimes a little clouded. It is semi-transparent, and is so hard, that it is seldom or never made into seals. It was formerly placed in the class of onyx's, of which it is a species, and was called the White Onyx. It is either *Oriental* or *European*; and those that have a mixture of a faint colour are hard and beautiful, and are taken for the oriental. Such as these have a purplish or blueish mixture, or a redness like that of lac. Those that are earthy, or of a dusky whitish colour, are of little value, and are met with in all parts of *Germany*. There are always some found in the *Netherlands*. Those that are tinged with a disagreeable reddish or yellowish colour, though they are not of the oriental kind, are in higher esteem than the last. Some of these have been seen in *Lorrain* of a surprising magnitude, and when they have been struck with a hammer have yielded a ringing

ringing found. Those are accounted best of all, in which there is blue, white, yellow, and red confusedly mixed together, and which exposed to the sun shew all the colours of the rain-bow. This also served to make the Myrrhine vessels of the *Romans*, which were so highly valued : and at this day they are wrought into cups, heads of great men, and the like ; but its chief use is for seals, because the wax will not stick thereto. Some of these stones are brought from the *East Indies*, that are almost transparent, and of a whitish pale colour ; some are tinged with white circles or zones. It is now of little value, except when the pieces are large and fit for the making of figures.

The ONYX, which in *Greek* signifies a nail, is so called from its likeness to the colour of the nail of a man's hand. It is seldom transparent, and generally consists of a mixture of black and white colours, which are quite distinct from each other. The horny colour is often marked with whitish veins or zones, somewhat resembling an eye. The kinds of Onyx are distinguished, either from the places where they are found, or from their different colours. The *Arabian Onyx* is black with white zones, and variety of other colours. When the white zone in carving any figure is placed on the top, and the black serves for a ground, it is called Camehuia by the jewellers, as if it was a distinct gem. When it is white, it is called a Chalcedony ; before described. Some Onyx's are quite black, others are tinged with fallow colour, yellow, whitish, blueish, and horn colours, mixed in an agreeable manner. They have all zones or streaks, which distinguish one colour from another. The Onyx has been sometimes found so large, that columns have been made therewith ; and there are now six of this kind in *St. Peter's church at Rome*. This likewise served to make the Myrrhine vessels before taken notice of, and is now made use of for cups, statues, and the like. It is of greater value than the sardonix, and those are best which are blueish at the top, and blackish at the bottom ; and these are much sought after by the *Jews*. This stone does not stick to wax, and therefore is as often now as formerly made into seals.

The AGATE is very like an onyx with regard to colour, but it differs from it in being adorned with zones, whereas the Agate has none; but instead thereof there are lines or spots of various colours, in such a manner as to represent the pictures of different things; as woods, rivers, fruits, flowers, herbs, and clouds; though not very distinctly. *Boet* had one, which, though no bigger than a man's finger-nail, was marked with a perfect circle, and within it was the figure of a Bishop with a mitre on his head. An Agate differs from a Jasper in hardness and smoothness; for though the jasper has all the same colours, it is softer, and consists of rougher particles.

The White-veined AGATE, with delineations of trees and mosses, is most commonly known by the name of the *Mocha* stone. It is of a very firm compact and fine texture, though it is found in the shape of a flinty pebble-stone. The sizes are various, being sometimes only one, and sometimes eight inches in diameter. The veins of this stone are very beautifully disposed in different figures; but generally there are many concentric irregular circles drawn round from one to three points in various places. They are commonly a little whiter than the ground, though sometimes they can scarcely be seen. Those of this kind are of the highest value, and contain the figures of trees, mosses, sea-plants, and the like, which were just taken notice of. Some have supposed that these are only petrifications, and that real mosses and sea plants were included therein; but this is a mistake, which is evident from hence, namely, that the real things which they represent were never met with so diminutive as their images in these stones: for none can be so foolish as to imagine, that there ever was a perfect tree no more than half an inch high. These figures are generally black, or of a dusky colour, and appear with great advantage from the whiteness of the stone. This kind of Agate, when it is perfect, is only found in the *East Indies*; but there some of an inferior sort to be met with in *Germany*. They are called *Mocha* stones, because they have been brought from the *East Indies* to *Mocha* in *Arabia*, and from thence transported

ported into *Europe*. However, there are some that will not allow them to be found in the *East Indies*; which if true, they may as well have the name from the place near which they are found; or at least they may be brought to *Mocha* from other parts of *Arabia*, or even *Asia*.

The Dull Milky AGATE is not so valuable as the former, though it is of a very firm texture. They are found in the shape of common flint stones, and are from one inch to ten in diameter. It is of the colour of milk, or rather like that of cream; and, when it is broken, it has a smooth glossy surface. It is more opaque than the former, and yet it will bear a very fine polish. This species is common on the shores of the rivers in the *East Indies*, and there are some of less value met with in *Germany* and *Bohemia*. This was much more in esteem formerly than it is at present, because it is now very common.

The Lead-coloured AGATE with black and white veins is by *Boet* called the Phassachates, and is of a very fine, firm, compact texture, though it is found like the former in the shape of common flint stones, and of as rugged a surface. The ground is of a pale blueish grey, or rather of a dove-colour; and it is often without variation, though it has sometimes black and sometimes white veins, which are generally towards the centre of the stone. This resembles an onyx very much, but is certainly distinct from it. It is very hard, and will bear a fine polish. It is found in the *East Indies*, as well as in *Germany*, where they make cups and snuff-boxes therewith.

The Flesh-coloured AGATE is not so valuable as any of the former, though within it has a pretty firm compact texture, and is from one to ten inches in diameter. The flesh-colour is very faint, and almost whitish; but yet it is never entirely wanting. Sometimes it has no veins at all, and at other times it abounds in veins, spots, or clouds. The spots are generally very small, about the size of a pin's head, notched at the edges; though sometimes they are much less. When broken in pieces it is very smooth and glossy, though it is not always of the same transparency.

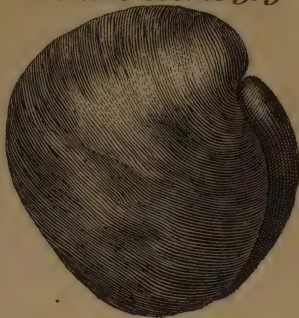
rency. It is found in *Germany*, *Bohemia*, and *Italy*, and is worked into various sorts of vessels: it is also often made use of instead of gun-flints.

The Blood-coloured AGATE is by *Boet* called the *Hæmachates*, and is more beautiful than most of this class. It is always of a deep blood-red colour, sometimes throughout, but more frequently variegated with a pale blue and brown. The blue always surrounds the red, and inclines to the colour of whey; but it is in no other part of the stone. The brown is of the colour of horn, and generally appears in irregular veins, sometimes in such plenty as to make the ground to the stone, and the red with its blue edges only the variegation. It is not very common, though it is found in the *East Indies*, *America*, and some parts of *Germany*. It is chiefly used for the tops of snuff-boxes.

The Clouded and Spotted Flesh-coloured AGATE is by *Boet* called the *Sardachates*, and is of a very fine close texture, though it is subject to flaws and cracks when the pieces are large; for which reason the lesser stones are most esteemed. It differs from the former kinds in having a smoother surface, and is generally of a roundish or oblong shape a little flatted. It has no variegations except exceeding small spots, which are of a beautiful red, that are variously disposed in different parts of the stone, and in different numbers. In some places it is more transparent than others; and it is found in the *East* and *West Indies*, as also in *Bohemia* and *Silesia*, though not so good. However, in general, it is in very little esteem with us.

The Red AGATE variegated with Yellow is of the colour of red lead, has a fine pure equal texture with a smooth regular surface, and is commonly found in the shape of a pebble stone. It is from one inch to four or five in diameter, and its ground is of a paler red with one that is deeper, disposed in concentric veins round from one to three points; but this does not appear without close examination. Besides these it has irregular bright yellow blotches, that are never intersected by the veins, but are either within or on the outside thereof; and they are always extremely
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short, being never above a sixth part of an inch in length. It is very hard, and will bear a very fine polish; and it is found in the *East Indies*, though not very common.

The Yellow AGATE is named by *Boet* the *Cera-chates*, that is, the wax-coloured Agate. It has been found from one to seven inches in diameter in various shapes and sizes; but they all are of a very firm compact texture. It is sometimes of the same colour throughout; sometimes consists of irregular veins, and at others has a pale and almost white ground, veined and spotted with a strong yellow, exactly resembling that of fine yellow bees-wax. It is very hard and capable of a fine polish; but the degree of transparency differs greatly, for sometimes it is as much so as any of the rest, and at others it is almost entirely opaque. It is found in the *East Indies* and *America*, as also in *Germany*, though not very good. In some places it serves to make knife-handles and the like.

The Pale Yellow AGATE, variegated with white, black, and green, is called by *Boet* the *Leonina*, from its likeness to a Lion's skin, and by the *Italians* *Bronzella*. It is more variegated than the rest of the stones of this kind, and has a fine compact close texture, though it is found in very irregular shapes, with a rugged outside. It sometimes seems to consist of an irregular mass, made up of the above-mentioned colours, and at other times distinctly clouded therewith, and sometimes again it has black and green veins in the form of concentric circles running round a point. The ground is always of a pale yellow, but very differently disposed; sometimes more, sometimes less. Likewise in some, one or more of these colours are wanting, while others contain them all. The green is like that of Jasper, and the black is inclinable to brown. It breaks with some difficulty into pieces, with fine smooth surfaces, and is brought from the *East Indies*; but it is not commonly known, because it is very scarce.

The Blackish Veined Brown AGATE is found in stones that have a pretty smooth surface, though of an

irregular shape, and from two to seven inches in diameter. The brown is pretty deep, and it is finely clouded, spotted, and veined with a colour that is almost black, and the veins are generally paler and browner than the other variegations. The veins are disposed in irregular concentric circles, and the innermost are generally broadest. There have sometimes been vegetable substances found in the middle of it, such as the slender roots of moss, or of crow silk. It is capable of a very high and beautiful polish, and is commonly cut into seals, buttons, heads of canes, knife-handles, and the tops of snuff-boxes. It is frequently adorned with factitious colours, which sink into the substance so much, that they appear like the natural veins of the stone; and then it is of great value.

The Greenish Brown Variegated AGATE seems to be of a middle nature between Agate and Jasper. It is a beautiful species, and is found in roundish stones with a smooth even surface, from two to six inches in diameter. Its texture is very firm, and it is sometimes of the same colour throughout, being only distinguishable from the true Jasper by its hardness. But it has most frequently a brownish green ground, variegated with irregular concentric circles, of a red or of a finer green; it is also found irregularly clouded and spotted, with the same or other colours, as white, flesh-colour and yellow. It is never entirely transparent in those that are clearest; and it is found in different parts of the world, but not equally good; for the *European* are the worst, they being more coarse, soft, and opaque than those of the *East* or *West Indies*.

The CAT'S EYE, or the Eye of *Belus*, differs greatly from the bastard Opal, because it is entirely opaque, and is a kind of Agate. It receives its name from the figure of an eye which is painted with divers colours. The body of this gem is white, and in the middle of it there is a spot like a pupil, surrounded with an iris of a lighter colour, which gives it the perfect resemblance of an Eye; but the colours are not so distinct as in the bastard Opal, though it has
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obtained the name of the Cat's Eye, because it is partly transparent, and within it is partly coloured like the Eye of a Cat. It is of a greater value than common Agate, because it is more scarce.

The JASPER differs little from an Agate, only it is softer, and will not bear so fine a polish, because it consists of grosser particles; besides, it is not so transparent, and is most commonly green; and the nearer it comes to an Emerald, it is of the higher value. However, it is of other colours, and on that account is divided into different species. among which are included the Nephritic Stones.

The White NEPHRITIC STONE has a very fine, compact, firm texture, with a smooth glossy surface, and is of various sizes; but the common sort are two inches in diameter. The shape is very irregular like a common flint, and it is naturally of a fine white, with great brightness and transparency. It has sometimes a blueish tinge, which makes it appear of a deep pearl colour, and upon that account is more valued by some; but when it is yellowish it is not in great esteem. It looks pretty much like marble, but breaks into fine glossy bits, and is considerably heavy, as well as very hard. It is found in many parts of *America*, particularly near the river of the *Amazons*. It is often cut into small cups and other toys, which are extremely bright.

The Green JASPER is a bright semi-transparent stone, and of a close, very hard, irregular texture. It has been found in masses of many feet in diameter, and sometimes no bigger than a horse-bean. It is of a deep beautiful green, and almost always of the same colour throughout; though it has been sometimes met with clouded with white. It is externally pretty bright and glossy, and breaks into smooth pieces, seeming to be of a texture between flint and marble. It is considerably heavy, and its very great hardness renders it capable of a fine polish.

The Soft Dusky Green JASPER is not so heavy nor so valuable as the former, and is generally found in stones of a flat shape, from two to five inches in diameter. The surface is pretty full of superficial
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cracks, and the colour is always dull, with sometimes a blueish and sometimes a brownish cast. It is of the same colour throughout, unless it has a paler shade of its own colour, or whitish clouds. It is hard, though not so hard as the former; but will cut very easily and take a pretty good polish. It is very common in *Germany*, *Bohemia*, *France* and *England*, and is sometimes found on the banks of rivers, and sometimes, though not often, in gravel-pits. It is so common in *Guernsey*, that it is frequently brought over with other things, and is often made use of to pave the streets of *London*.

Hard Blueish Green JASPER, variegated with red, is called by *Boet*, after the ancients, *Heliotropium*, and by others *Oriental Jasper*. It may be easily distinguished from all others by its blood-red spots, and it has a very firm and compact texture. It is found from two to six inches in diameter, and has a roughish irregular surface, but has no determinate shape. It is not at all transparent, except in very thin pieces, and it is sometimes veined and clouded as well as spotted with red. It is most commonly known by the name of *BLOOD-STONE*, and will take a very fine polish. It is common in *Egypt*, *Africa*, and the *West Indies*, and is by some termed the matrix of the *Emerald*. It serves for various purposes, particularly cups, snuff-boxes and seals. *Boet* assures us, that it has been found in such large pieces that *Sarcophagi* have been made therewith to inclose the bodies of the dead; likewise over the high altar at *Bruges* there was a stone placed of this kind, which was brought from *Italy*, and was taken from thence at the time of the reformation.

The Hard Whitish Green JASPER is the nephritic stone of the ancients, and is generally of the same colour throughout. It is harder than a Jasper, and the surface seems as though it was smeared with oil. When it is reduced to the size of a man's little finger it is a little transparent, and is called by the *Italians*, *Osiada*. It is sometimes of a whitish green, which last colour is sometimes yellowish, and sometimes blueish; but generally it seems to be composed of greenish white, yellow, blueish and black colours; but

but not all at the same time. The common sort are from two to five inches in diameter, and the shape is very irregular like common flints. *Boet* had several kinds, one of which had a white cloud like crystal, which he had taken off from the green. It is found on the surface of the earth, and in the beds of rivers in many parts of *America*, where they form them into the figures of birds, beasts and fishes.

The very hard Yellowish Green JASPER is more dull and opaque than the former, though the texture is very firm and close. It is usually found from one inch to twelve in diameter, and is generally of a flattish shape with a glossy surface. The colour is properly a mixture of green and yellow, in which it differs chiefly from the former, and in its transparency.

The Blueish Green JASPER, variegated with blue and black, is a kind of nephritick stone, it being of a middle nature, between the oriental green Jasper, the green nephritick stone, and the marble Ophites. The texture is firm and compact, and is found from four to six inches in diameter, and generally of a flattish oval shape, with a rough surface. The colour is usually very agreeable, and is always made up of a mixture of green, grey and blue, which are sometimes paler and sometimes deeper, as well as inclining to other colours. Sometimes they are so blended, as to render it of one colour throughout, and sometimes they are disposed in clouds, spots and veins; and then the colours are as distinct as in the blood-stone. It is found on the banks of the great river of the *Amazons* in *America*.

The Hard Greyish Green JASPER is called Jade by the *French*, and is a very hard stone of a greyish green colour, approaching to that of an olive; but the green is of three different kinds. The finest sort is brought from the *East Indies*, and the *Turks* and *Poles* make handles of it for their sabres and cutlasses. It is so hard, says *Lemery*, that it cannot be worked without the powder of diamonds. Some call it Divine stone, on account of the great virtues attributed thereto; but these are all imaginary. It is capable of a
very

very elegant polish, and is found from six to ten inches long, of an unequal shape with a rough surface. It has little or no degrees of transparency, but it is remarkably heavy, and is found only in the *East Indies*.

The Dull Deep Green JASPER is the Malachites of *Boet*, and is of a green colour like mallows, from whence it had its name, for *Malache* in *Greek* signifies mallows. It is generally adorned with white veins, and the blueish colour that is intermixed is very ornamental; but when there is any black therein it debases the value. *Boet* informs us there are four kinds, namely, that which is exactly of the colour of the leaves of mallows; that with white veins and black spots; that with a blue colour exactly intermixed, and which is nearly of the colour of a *Turky* stone, which is more valuable than the rest, and is so large, that small cups and handles of knives may be made thereof. It is pretty heavy, and will take an excellent polish. It is brought from the *East Indies* and *America*, and is also found in *Germany*, and some other parts of *Europe*, but is not so good as the former.

The Blueish Green Soft JASPER is the same as one of the former mentioned by *Boet*, and is much softer than the first. The texture is not so firm and pure as many other of the Jaspers, though the surface is very smooth. It is generally small, being seldom more than two inches in diameter, and it is of an oblong form, being twice as broad as thick. The colour is various with regard to the degree, being sometimes lighter and sometimes darker, though it always consists of green and blue; but there is now and then more of the one and less of the other always blended together. It is at present found chiefly in *America*, and some parts of *Germany*, in which last place it is not so valuable.

The Dusky Green JASPER, variegated with white and flesh-colour, is a rough, coarse and rugged stone, which is found from thirteen to eighteen inches in diameter, and is generally of a roundish or oval shape, and always flatted more or less. The texture is firm and compact, and it is often mixed with a variety of colours

colours disposed in a different manner. It is always green in part, and has often thin transverse veins of flesh-colour and white, with spots and clouds of black. The green is not always the same, for it is sometimes deep, and at other times light; but generally the variety is very agreeable. It is very hard, and for that reason will bear a good polish; and it is common in the island of *Jersey*, from whence it is brought among other stones to pave the streets of *London*; but it might be put to a much better use.

Hard Variegated Purple JASPER has been called the rose-coloured Jasper by *Pliny*. It has a smooth, fine, hard texture, though the surface is rough and unequal like a flint stone; it is sometimes fifteen inches in diameter, and is variously tinged with colours, in which the red and blue are always predominant, which when uniformly mixed render it purple; but where it is blue, it is always most bright and transparent. It is brought from various parts of the world, as the *East* and *West Indies*, *Egypt*, *Germany*, *Bohemia* and *Spain*; in which last place it is cut into vessels and images, because it will bear a very fine polish.

Bright Red JASPER variegated with white is not so hard as the former, nor of so fine a texture, and it is found from the size of a hazle-nut to that of a man's head. The colour is that of red lead, and the most certain colour of the variegation is white, which is almost always disposed in regular narrow veins, though sometimes in spots. That which comes from *America* is generally accounted best.

Dull Purple and White JASPER is of a coarse and irregular, though of a very firm texture. The purple colour sometimes insensibly changes into a pale red, and the white to a yellowish or blueish colour, and it is hard to say which of the two is predominant. It is considerably heavy, and so very hard that it is capable of a good polish. It is brought from *Italy* and *Germany*, as well as found in *England*, and serves to make the handles of knives and tops of snuff-boxes.

Pale Brown Hard JASPER with purple veins has much the same texture as the former, but is more beautiful.

beautiful. It is usually found from two to four inches in diameter, and is commonly of an oblong flattish shape. Its ground is an agreeable pale whitish brown, and its variegations consist of regular horizontal and fine deep purple veins, or of a pretty pure white. It is common in *Yorkshire* and *Sussex*, and is sometimes met with in gravel pits near *London*.

Yellowish Hard Variegated JASPER has a very close, hard, and compact texture, though the surface is very rough and irregular. It is generally met with from three to seven inches in diameter, and the predominant colour is a pale dusky yellow, not unlike honey. It is variegated with white, brown, lead-colour and a very pale red, with which is mixed a cloudy crystalline substance. These colours are blended in the form of clouds; but sometimes one and sometimes another is wanting. It is extremely hard, and will take a very fine polish. It is very common in the *East Indies*, and is also met with in several parts of *Europe*. The only use of it at present is to make handles for knives.

The Pale Blueish JASPER, with black veins and clouds, has a very close firm texture, and its size is from four to six inches in diameter. It is always of a dusky blue or lead-colour, and the black clouds always appear like curling smoke, by which characteristick it is taken notice of by *Boet*. It is but of little value, and consequently not much in use.

The Blueish Marbled JASPER, variegated with white, is of very little value. The colour is of a pale disagreeable grey, and a pretty clear white; but the former colour is the ground, and the other appears in veins or irregular clouds. It is pretty heavy, hard and will bear a good polish. It is common in the gravel pits about *London*, and is generally taken for a bit of blue and white marble that seems to be worn by the collision of other stones, for it is rounded at the edges.

The Black Marbled JASPER variegated with white is a very common stone as well as the former, and is often mistaken for a piece of black and white marble. Its size is uncertain, and the shape irregular, though
generally

generally somewhat round. The ground is black, and the variegation white disposed in veins. The surface is smooth, though it has but little brightness when broken; however it is capable of a beautiful polish. It is common in many of our gravel pits.

The Black Marbled JASPER marbled with yellow, like the two former, is taken for a fragment of marble. It is of a coarse but compact texture, and its size is from one to seven inches in diameter. The colours are a fine deep black and a palish white, or a brownish yellow, which are so equal that it is hard to say which is predominant, for it consists of thin plates of both laid closely on each other. It is very hard, and will bear a very fine polish. It is common on the shores of *Yorkshire*.

The Hard Dull Flesh-coloured JASPER is extremely hard, and of a very close texture, and is found from eight to eighteen inches in diameter. It is of extremely pale whitish red or flesh-colour, which is generally the same throughout, though there are sometimes horizontal veins of a darker red. It is found on the sea-shore, and is commonly made use of in pavements. It must be observed, that all these Jaspers strike fire with steel, and will not effervesce with aqua fortis.

The TURKY STONE, called by some the Turquoise, is of two kinds, the oriental and the occidental; the first is rather blue than green, and the other is more inclinable to the latter colour, though it sometimes inclines to a whiteness. They are found in the *East Indies*, *Persia*, *Spain*, *Germany* and *Bohemia*. In *Persia* it adheres to blackish stones, and they are very common; but it seldom exceeds the size of a hazle-nut. Those of the *East Indies* differ in their colour, for such as are said to be of the old rock always preserve the same colour, but those of the new are more greenish. This stone is in so high esteem among the *Turks*, that those of the better sort are seldom or never without one; but it is never worn by the women. It is generally valued in proportion to the brightness of the colour. Those that are of the size of a hazle-nut, are of a fine sky blue without any blackish veins;

veins; but the lesser sort are not so good. Those that have blackish veins, or are inclinable to greenish, or to the colour of milk, are of no value. Some take it to be a copper ore, and is supposed to be counted a gem only for its fine colour. There is another *Turkey* stone which is nothing but ivory, a tooth, or a bone which have lain in the neighbourhood of copper ore till they have been tinged with deep blue spots and veins; but when they are put into a gentle fire the colour diffuses itself throughout the whole substance, and becomes of a very fine pale blue. There are several mines of these stones in *France*; but they may be perfectly counterfeited by art with a tincture of copper in an alkaly.

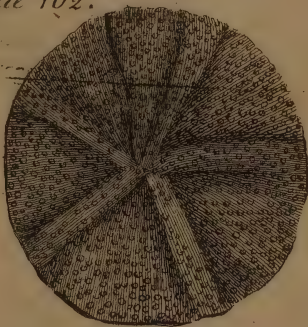
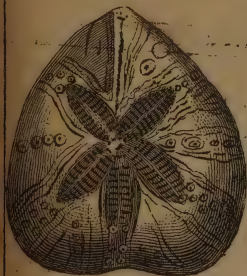
The LAPIS LAZULI is an opaque stone of a saphire colour, with golden spots or streaks. It differs from an *Armenian* stone in being harder, for this may be easily reduced into powder; and besides, it is without veins of gold. This is the stone with which they make the colour called Ultramarine. It is of two kinds, one of which will remain unchanged in the fire, and the other not. It is found in various countries, as in *Asia*, *Africa* and *Germany*; and the *Armenian* stone is said to be its matrix, which is met with in gold mines. It is found in very large pieces; but the common sort are only big enough to make knife-handles and the tops of snuff-boxes. The best sort, which is that that will not change its colour in the fire, is brought from the *East Indies*; and this is the test whether it is right or not; for that in *Germany*, which is of a middle nature between an *Armenian* stone and the true Lapis Lazuli, alters in the fire, and is much more brittle than the true. However, they both will serve very well for the use of painters. Lapis Lazuli has the property of purging upwards and downwards, and therefore has been accounted good for melancholy disorders, quartan agues, apoplexies, and the falling sickness. There is no room to doubt that the blue colour arises from particles of copper, for which reason it is taken by some to be a copper ore.

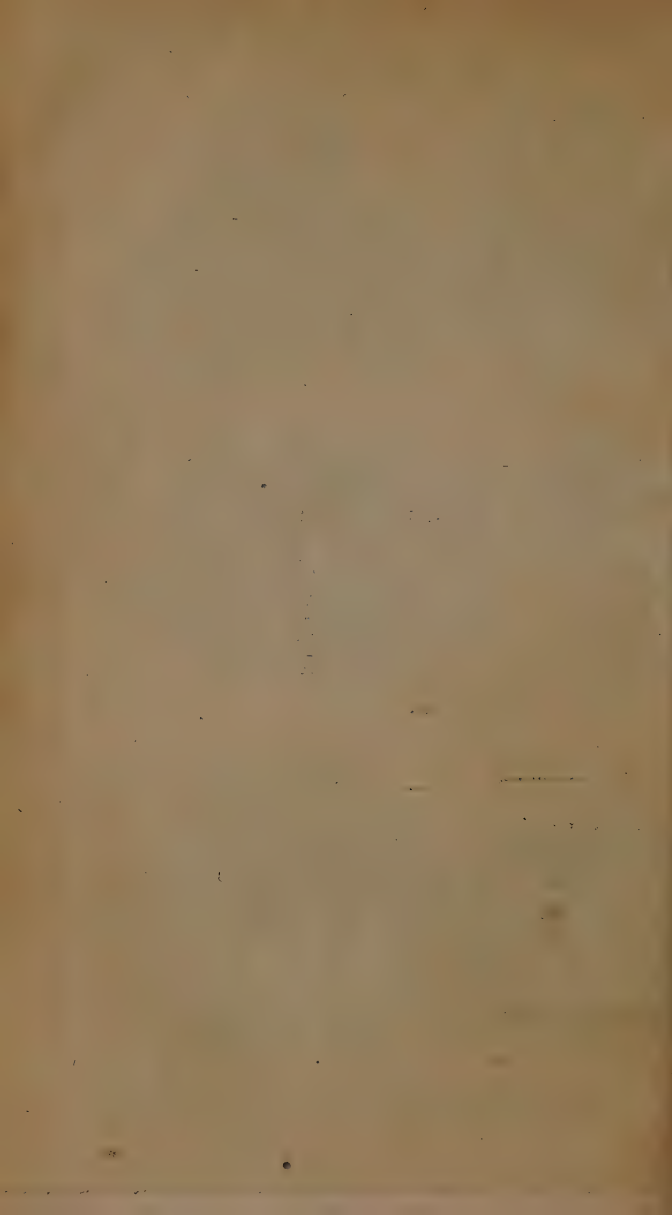
The ARMENIAN STONE has a smooth surface, and is of a sky-blue colour; but it is brittle, by which

Astroites 324.



Brontia 162.





it may be distinguished from Lapis Lazuli; besides which it has no gold spangles, nor will it keep its colour in the fire. The blue colour has a greenish cast, and when it is made use of in painting, by length of time it changes to green. It is found in various places of *Germany*, as in the County of *Tyrol*, and in other silver mines. It is also met with in *Hungary* and *Transilvania*. It has the same faculties as the Lapis Lazuli, only it is stronger, and has been given for the same purposes to a scruple; but it is now quite out of use. Whenever it is used as a paint, it must be mixed with petroleum, or rock oil, and then it will keep its colour. The method of preparing it is by grinding it to powder, but not very small; after which it is to be mixed with water, stirring it about for some time, and then letting it settle till the heavier particles sink to the bottom. This done, the water is to be poured into another vessel; and if there is much sediment remains, with extraneous matter, it is to be washed over again. When it appears to be quite free from it, it must be ground very fine, and put into small cups, with a solution of Gum Arabic. It must be kept stirring with the fingers, to prevent the powder from sinking to the bottom. Then it must stand for half an hour, at which time it must be poured off, and will carry the finest part of the colour along with it. What remains is the worst part of the colour, and must be kept by itself. Then the same process must be repeated with regard to the finest part of the colour, and it must settle as before. If this be done several times, a very fine colour will be obtained.

The ASTROITES, or STAR STONE, seems to be a kind of opal, and by some is called a Cat's Eye, or Gem of the Sun; but that which is properly so called has been treated of before. It is a very beautiful stone, and is usually set in rings: it contains the figure of stars so exactly, that no painter can imitate them better. It is an opaque gem, sometimes of a white, ash, dusky, or grey colour. In this sort of stones are sometimes seen roses, sometimes waves, and at other times they contain all three together; which may serve as so many different distinctions of this stone.

stone. It is found in various places, particularly in *Tyrol*, as large as a man's head. *Cardan* says, when it is put in vinegar it will move about, and that a fluid will proceed from the stars or marks in the stone. He attributes the motion to the fluid endeavouring to get a vent; but it is more probably owing to the action of the vinegar upon it, which may put it into a kind of fermentation.

The TOAD STONE seems to be a kind of an astroites, for it is of the colour of that stone, and marked with dark spots, only the ash or grey colour has a reddish cast. It is convex like an eye on one side, and flat on the other. There are two kinds of these stones, the first of which is called by some *Brontia* and *Ombria*, and are of a dusky, reddish, yellowish, or greenish colour; sometimes of the size of an egg, and like one, only they are flat on one side. Some take these to be serpent stones or thunderbolts; but the common name is that of a Toad Stone. All these stones differ among themselves: however, that properly so called has the name of *Batrachites*, but the *Brontia* and *Ombria* are called *Chelonites*. It is now taken to be a petrified substance, and some suppose it to be the tooth of a fish; but this does not seem to agree with its shape. Indeed there may be some in the form of teeth comprehended in this general name; but that resembling an egg is the most common sort. They are all hollow more or less, only some are filled up with the stratum in which they lay, and some of them resemble the cup of an acorn. Another sort are of an oblong figure, but round at the top, and others swell a little in the middle. Many of them have an outward circle of a different colour from the rest, and this is sometimes streaked with very fine lines: some are also found very long in proportion to their breadth, and others perfectly round. They are all naturally of a very fine polish, and are worn in rings without alteration. They are of different sizes, from a pin's head to two or three inches in circumference; and are of a great variety of colours, as above taken notice of.

Cockle Stone 302.

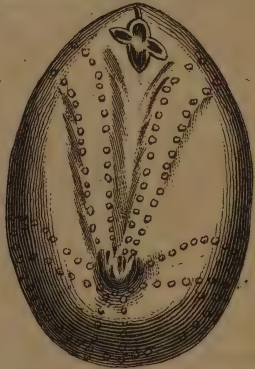


Barbel Stone 302.



Brontia 162

Cockle Stone 302.



C H A P. XX.

Of the more ignoble S T O N E S.

THE EAGLE STONE seems to consist of several shells or crusts laid one over another; but that which distinguishes it from all others is its being hollow on the inside, in which cavity there is another stone that is smaller: this, when it is shook, may be heard to rattle. It is of various colours, as white, grey, dun, or brown. It is by *Pliny* divided into four kinds, the first of which is found in *Africa*, and is soft, making but a small noise when rattled; and it is brittle, and of a white colour: this he takes to be the female. The second is the male, which is found in *Arabia*, and is very hard, and of a reddish colour, containing a hard stone within it, as may be known by the noise. A third sort is found in *Cyprus*, and is of the same colour as those in *Africa*, but larger and more round. The stone that is contained in the cavity is so soft, that it may be crumbled between the fingers. A fourth kind he calls *Taphiusius*, which is met with in *Leucadia*, now called *St. Maur*. It is of a whitish colour, round, and found in the rivers. Later authors have only three sorts, the first of which is rough on the outside, and is of different colours, but commonly of a black dun: this makes a very distinct noise when rattled. The second is of an ash colour, and contains a sort of marl in the inside, which is sometimes white, yellow, red, or blue. The outside is rough and sandy, and seems to consist of the particles of flint. A third is of several colours, but has the like contents as the former. The first kind is no bigger than a peach-stone, but the other two are often as large as a man's fist. These sort of stones are found almost every where; and one was very lately picked up in the new road leading to *Kennington Common*, but was like none of the former; for it was very large, and by its rattling shewed it contained a stone of

of a very hard substance. The Oriental kind is said to be taken out of an Eagle's nest, from whence this stone had its name; and it was said to have very great virtues in promoting child-birth, when tied to a woman's thigh; but this property is well known now to be fabulous.

The GEODES is a sort of an Eagle Stone of a round shape, and contains sand or earth, which makes no noise when shook; for when it rattles it may be properly placed in the former class. It is found in *Misnia*, and near *Pelsna* in *Bohemia*. It is of a reddish colour, and of the size of a man's fist; but it is of no manner of use. There is another of this kind that is white, of an oblong figure, and sharp at both ends. When it is broken it seems to consist of crusts or shells, not unlike the bezoar stone; and perhaps is the same that is called by some the Fossile Bezoar.

The ENORCHUS is another species of an Eagle Stone, and is generally of the size of a pigeon's egg. This contains one stone within another, as the yolk of an egg is contained in the white. It is not smooth on the inside, but it is tinged with various dirty colours; and on the outside it is of an ash colour.

This is all that *Boet* mentions of these stones worth taking notice of; but other authors have other kinds, as the Brown and Purplish EAGLE STONE, with a whitish green nucleus or kernel. This is generally of an oblong oval figure, being about an inch in length, and half an inch in diameter. The Rough Purplish EAGLE STONE, which has a thin crust, and contains a large kernel of very light earth. The shape is nearly round, and it is about half an inch in diameter, with a very rugged surface. The nucleus or kernel is a pale or whitish earth, with a small cast of green. The Red and Dusky Yellow EAGLE STONE, with a greenish white nucleus, is very indeterminate as to shape and size. The nucleus is very hard, and consists of a greenish white earth, which will readily melt in the mouth. It generally consists of five or six coats, and the outermost is a thick clayey substance, containing a large quantity of sand. It is extremely brittle, and very rough on the outside; but the crusts

are

are hard and firm, and not easily broken. The Yellow Brown and Black Crusted EAGLE STONE, with a whitish nucleus, is almost always of an oblong form, with a rough uneven surface. It is usually about four inches in length, three in breadth, and two and a half in thickness. The outward coat is of the same substance as the inner, and has a very rugged appearance. The nucleus is a pale whitish earth, and though it is considerably hard, it readily melts in the mouth. The Purplish Red EAGLE STONE is very indeterminate as to shape and size, but the texture is firm and hard. The surface is pretty smooth, and is of the same substance as the other coats. Some of these have been found twelve inches in length, and four in diameter. The nucleus is different from the crusts, it being very light and fine, though hard, and of a pale yellow. The Coarse Yellow and Brown EAGLE STONE, with a brownish yellow nucleus, is considerably heavy, though not hard; and is generally of a roundish or oval shape, between one inch and two in diameter. It consists of from two to four crusts, and incloses a hard solid nucleus, which will rattle when shaken. The Coarse EAGLE STONE, with brown, black, and orange-coloured crusts, and a yellow nucleus, is of a spongy texture, though moderately heavy; but is very irregular both as to shape and size. It is usually about an inch and a half in length, and about half as much in diameter. This stone when perfect is composed of six or seven crusts, which are alternately of a dusky brown, a reddish yellow, and purplish black colours. The nucleus is coarser than the shells. The reader will plainly see to which of these kinds the former are to be referred.

There are also five kinds of the Geodes, which are distinguished by the names of the Cracked GEODES with ferruginous brown and yellow crusts. This is always hollow, heavy, and of a regular shape; it being oblong, and larger in the middle than at the ends. It is generally about two inches long, an inch and a quarter broad, and three quarters of an inch thick. The outer shell or crust is of a yellow colour, with a mixture of reddish brown; and is smooth to the touch,

though

though it is all over cracked in different directions. However, it is very hard, and will not break without a strong blow; and, when broken, it is found to contain a yellow earth, with a little mixture of sand. It usually consists of three crusts, the innermost of which is of a blueish black colour, the middle of a deep brown, and the outermost yellow as above. It is met with among gravel.

The Wrinkled GEODES, with ferruginous, reddish brown, and gold-coloured crusts, is very heavy when pieces of it are considered apart; but when unbroken it is light, because it consists of a large hollow case. It is about three inches long, and two and a half in diameter, and has no distinct coat different from the general substance. It is of a fine yellow gold colour, with a small mixture of brownish red, and is full of wrinkles or superficial cracks. The cavity is usually divided into several cells, and contains a small quantity of fine bright yellow earth. The shell when perfect consists of a great number of coats, some of which are of a ferruginous colour, others of a reddish brown, and others as yellow as gold.

The Sparkling GEODES, with ferruginous, purple, and orange-coloured crusts, is subject to great varieties, excepting the internal structure. However, it is generally oblong and flattish, and sometimes it is full of protuberances, sometimes branched, and sometimes again tapering to one or both ends. It is bred among gravel, and consequently has a very rough outside, it being covered with pebbles of different sizes. It is generally four inches long, two broad, and an inch and a half thick; though sometimes it is twelve inches long. Different stones contain earths of different kinds; and the shell is composed of eight or ten coats, which are all bright and sparkling. Some are of a dark iron grey colour, others of a dusky purple, and others of a saffron or orange colour.

The Long Rough GEODES, with a single purplish crust, is always of an oblong shape, of a firm substance, and considerably heavy and hard. It is yellowish on the outside, and is about four inches long, and three quarters of an inch in diameter; but the sur-

face

face is strangely rugged and uneven. It has only a single coat of a mixed purplish iron-grey colour, and is a little sparkling.

The Long GEODES with a single blackish crust is always of an oblong irregular form, it appearing frequently twisted, and of a different thickness in the different parts of the same mass. The outside is generally so invested with a stratum in which it was formed, as to appear of a brownish yellow. It is sometimes two inches long, three quarters of an inch broad, and above half an inch thick; but it varies in size. It is very brittle, and when broken is of a blackish colour a little sparkling; and the cavity is filled with very fine bright red earth, though sometimes it is not without mixture.

The stone called ENHYDRUS is a-kin to the Eagle stone, but it contains nothing but water. The first of these is the thick-shelled Enhydrus, with black, reddish brown, and yellow crusts. It is of a close, even, compact texture, pretty heavy, and very hard; and always is of an irregular roundish shape, but very flat, rising in the middle, and thinner towards the edges. It is about four inches in diameter, and two thick where thickest. The surface is rough, and of a mixed yellow and brownish red colour. When broken it is found to be a very thick shell or case, containing a small quantity of water, which is generally muddy. The shell usually consists of three thick coats, of which the innermost is blackish and shining, but that in the middle is of a dusky brownish red, and the outermost of a bright yellow. The cavity is large, and generally divided into different cells.

The Thin-shelled ENHYDRUS, with yellowish brown and purplish crusts, is always of an irregular oval shape, with many cavities and prominences thereon. It is commonly about three inches long, and almost as much in breadth and thickness. The outside is very rough, and when broken it is found to contain a whitish fluid as thick as cream. The shell is but thin, consisting only of two coats, the innermost of a fine deep purplish colour, and the outermost of a yellowish brown.

There

There are still other stones of the Eagle kind which may be referred to the Enorchus, of which the first is the very Hard Smooth ENORCHUS, with brown, yellow, and red coats. The texture is fine and compact, with a pretty smooth even surface, and it is remarkably heavy. It is always of a roundish oblong figure, and is found from a quarter of an inch to four inches in length; but its usual size is that of a pigeon's egg. It is sometimes met with smooth and glossy, and sometimes covered with a whitish crust. It consists of only five or six coats, inclosing a firm, hard, and solid nucleus of the same nature and texture. This is of a deep dusky brown colour, sometimes of a strong red, and sometimes has a mixture of both. The coats are alternately dark brown, and reddish.

The Hard Glittering Rough ENORCHUS, with brown, purple, and deep yellow coats, is much more rugged than the former, and of a coarse unequal texture. It is always of an oblong shape, and is found of several sizes, from half an inch to eight inches long. The surface is made up of small prominences and cavities, less than the heads of the smallest pins, which give it the appearance of shagreen. The nucleus is but small, and is surrounded with eight or ten coats, irregular in thickness and of several colours, as pale brown, deep brown, dusky and reddish yellow; and the nucleus is sometimes purple, but more generally of an orange colour. The substance is pretty bright and sparkling, not only within, but on the surface of the stone.

The Soft Brownish Yellow ENORCHUS is quite of a different nature from the former two; for this is only a composition of soft earth, though the texture is close and smooth. It is always of a flattish oblong shape, and is commonly four inches in length, two in breadth, and one in thickness. It is of the same colour throughout, and the nucleus is of the same shape as the stone, but is of a very agreeable brownish yellow, as well as the coats themselves, which are almost innumerable. It has no manner of brightness, but has the appearance of clay.

Scallop Shell
305



Petrified Grass 301.



Deep furrowed Conchites
303.



Brontia 162.

Pectunculus 305



The Soft ENORCHUS, with shining brown and dusky green coats, is of a coarse loose texture, but is remarkably heavy, and always of an oblong shape. It is about an inch and a half in length, and is thick in the middle and small at both ends, like a ninepin. The surface is rugged and uneven, and the stone itself is very brittle. It consists of three or four coats surrounding a nucleus of the same substance as themselves, and of a very dark greenish colour. Next to this is a coat of brown, and then one of the same colour as the nucleus; after which comes one of a very pale brown, with a glittering appearance, inasmuch that it may be mistaken for a crystal by its looks. Over all these is a coat of dusky brown clay, which is very rugged and unequal. This is very common in several parts of *England*.

The Soft ENORCHUS, with shining whitish yellowish and red coats, is of a loose brittle texture, but moderately heavy. It is commonly oblong, round at the ends, and about the size of a pigeon's egg. The surface is rough and uneven, and it will break with a small blow. It is composed of four, five, or six coats, some of which are whitish and grey, others yellowish, and others of a very fine red, all which sparkle prettily. The nucleus is generally whitish, and sometimes a mixture of white and yellow. It is found in the clay pits of *Northamptonshire*, and other counties of *England*.

The HÆMATITES, or BLOOD-STONE, is so called from its colour, which is that of darkish blood; though it is sometimes black, sometimes yellow, and sometimes of the colour of iron; but its streaks always resemble antimony, and when it is calcined it turns to a reddish colour. It was formerly divided into several kinds, but now there is only one treated of by authors. It is found in various parts of *Germany*, in marl pits and iron mines. It is now known to be a rich iron ore; for, when melted, a great deal of that metal may be extracted. It is of various degrees of purity and hardness; for sometimes it is of a coarse texture, and seems to be composed of large filaments. With regard to its medicinal qualities, it has been ac-

counted good in spitting of blood and ulcers of the lungs, when given from half a dram to a dram; but it is now generally used in some disorders of the eyes, especially to remove spots and films.

There is a bastard Hæmatites found in *Silesia*, which when burnt is of the colour of saffron of iron, and has the same effect in stopping of bleedings. There is also another kind found in iron mines, of a round shape, partly of the colour of marl, and partly of a blackish iron grey. A third kind is of an iron grey colour.

The SMIRIS, in *English* EMERY, may be placed in the class of the Hæmatites. It is of an iron grey colour tending to blackness, and so hard that it is used by jewellers, glass-grinders, and smiths, for polishing their work. It will cut glass almost as well as a diamond, and is reckoned a sort of an iron ore. It is found in large masses, bespangled all over with shining specks.

The MAGNESIA, or MANGANESE, is nearly of the same substance with the Hæmatites, it being composed of regular parallel streaks of particles diverging from the centre to the circumference when it is fine; but this is very scarce: and there is another not quite so pure, which is irregularly streaked like the steel-grained lead ores; but the common Manganese is quite irregular, though it is very heavy and moderately hard. It is of an iron grey colour approaching to black, though sometimes a little brown; and is found in large masses of no determinate shape, with a rough, rugged, and unequal surface. It is found in *Germany*, *Italy*, and many other places besides *England*, where it is met with in *Mendip* hills. When the miners find any of this substance, they certainly conclude that lead ore lies under it. The potters make use of great quantities of it for black glazing, as they do blue with zaffer. It is also employed in making glass, to take away the natural greenness or blueish colour which is in all glass.

The PUMICE STONE is spongy and full of small holes and cavities. It is of several colours, as ash-coloured or white, which are so soft that they may be crumbled

crumbled to pieces between the fingers; but some are more hard, though they are all so light that they will swim on the surface of the water. It is found in divers places, but especially near burning mountains, from whence it is thrown out. It is used by various artists for different purposes; and in some places they use them in the baths to clean the skin. The powder has been used for cleansing, drying, and cicatrizing ulcers, as well as to clean the teeth; but it is now out of use for medicinal purposes.

The MAGNET or LOAD-STONE is well known for its property of attracting iron, and for its polarity; for, when suspended, one end always points to the north, and the other to the south. It is found in various places, and often in iron mines; which is no wonder, for it is a kind of iron ore. It is generally of an iron grey colour, with a blueish cast, and sometimes reddish without, and blackish within; but that which is bluest is best. When a needle is touched with a Load-stone, the Magnet will not attract both ends equally, but will repel the one, and draw the other; which is known almost to every one. It was formerly given medicinally for the same purposes as the Hæmatites, and particularly for purging off water in the dropsy; but now it is not used in medicine.

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C H A P. XXI.

Of LOAMS, or EARTHS found in Strata or Beds.

THE WHITISH LOAM is coarse, loose, soft, and moist, while in the stratum; and though it is easily cut with a spade, it will not stick thereto. When dry it is of a loose crumbly texture, considerably heavy, hard, harsh, and gritty to the touch. It does not at all stick to the hand, but will melt freely in the mouth, and makes a slight hissing noise when thrown into the water, where it almost immediately falls into a loose powder. It is composed of a large coarse white sand, united to a greyish marly clay, and

will burn to a pale brownish red. It is sometimes mixed with stiff clays in making of bricks.

The Brownish White LOAM is of a fine even texture, and consists of very fine white sand joined to a pale brown clay. When it is cut with a spade it leaves an even surface, and when dry it is of a whitish brown colour; but so very pale, that the brown scarce needed to be mentioned. It does not break very easily between the fingers, nor does it stick to the hands; but it will melt in the mouth, though slowly, and makes a violent effervescence with aqua fortis. It is used for making bricks mixed with clay, and then turns to a pale red colour.

The Pale Yellow LOAM is of a spongy texture, and consists of white sand united to a yellow clay. When it is cut with a spade it leaves irregular masses with a rough uneven surface behind it, and when dry it is loose and spongy, and seems mixed with a great number of shining particles. It is harsh and dry to the touch, and crumbles readily between the fingers, but does not stick to the hand. It makes an effervescence with aqua fortis, and turns red in the fire; but it is never used alone for bricks.

The Rough Yellow LOAM consists of a coarse yellowish sand, joined to a pale yellow clay, which in a few places is white. It is smooth when cut with a spade, and when dry is extremely hard. It makes no effervescence with aqua fortis; but when thrown into the water it makes a little hissing noise, and soon falls into a loose powder. It turns to a deep red in the fire, and makes excellent bricks for making furnaces for melting iron, and even endures the fires of the glass-houses; it also makes fine lutes for chymical vessels. It is met with near *Hedgerly*, five miles from *Windsor*, and bears a considerable price.

The Deep Dusky Yellow LOAM consists of a deep yellow and a whitish sand with a very little clay, and is very harsh and coarse. It is moist in the stratum, and when dried is of a loose texture, readily crumbling between the fingers without sticking to the hands. It makes no effervescence with aqua fortis, nor does it

hiss

Olive Stone 312



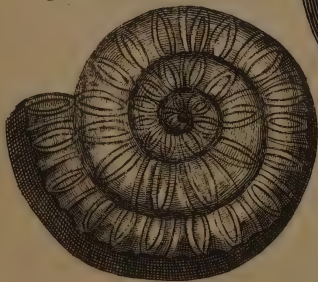
Brontia or Hemispherical Stone 162



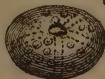
Brontia 162

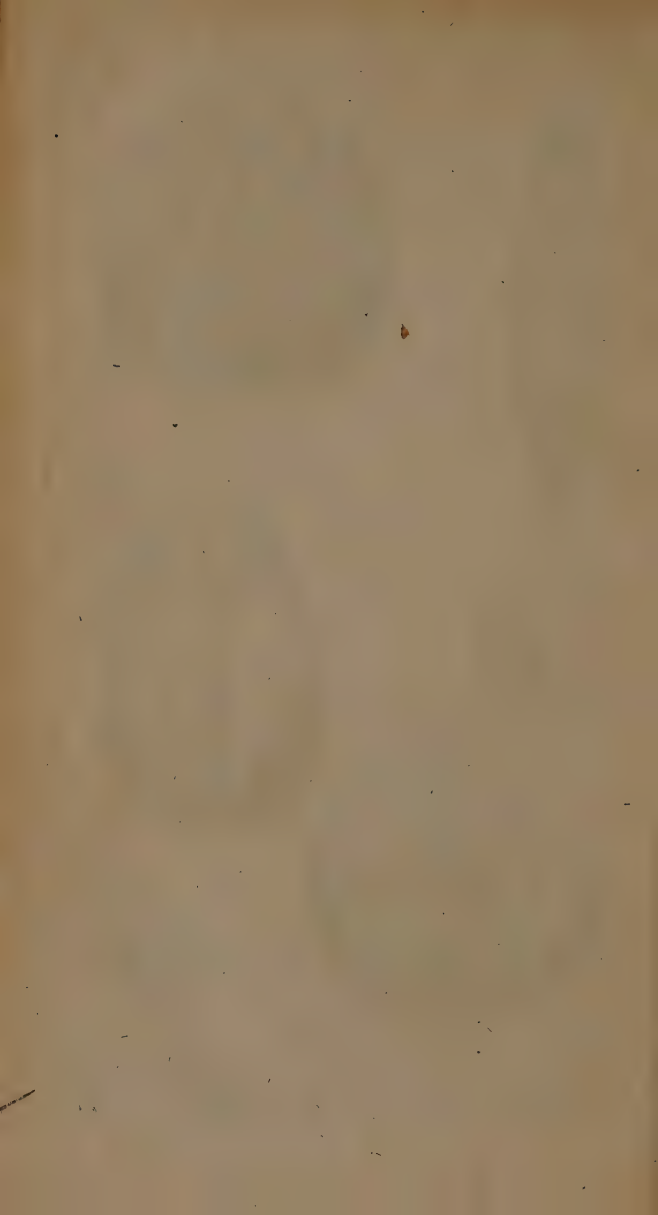


Ophiomorphites 310



Echinites 307





hiss when thrown into water. It is used for making bricks when mixed with good clay.

The Hard Brown LOAM consists of large white sand and deep brown clay; it is very hard, but not tough, though it cannot be got up without pick-axes: when dry it is very hard and heavy, and will not break between the fingers. It will not hiss when thrown into water, nor make an effervescence with aqua fortis. It is often full of small sea-shells; and in *Northamptonshire* it is so full of them that they make floors for barns therewith; it likewise serves to make roofs for ovens, and other purposes.

The Light Pale Brown LOAM is the lightest and most spongy of any of this kind, and is composed of fine pale yellow sand, mixed with light brown clay. When dry, it crumbles easily between the fingers, and sticks a little to the hand. It will not effervesce with aqua fortis, but when thrown into water makes a little hissing, and almost immediately falls into a loose powder.

The Yellowish Brown LOAM consists of a white and yellow sand, together with a small quantity of fine brown clay. It is moist in the stratum, and when dry is of a loose crumbly texture, with a rough and somewhat dusty surface. It makes an effervescence with aqua fortis, and hisses a little when thrown into water. This sort alone will make fine red bricks.

The Greyish White LOAM is composed of a fine white sand and a pale blueish clay, spangled with a great number of small plates of talc. While in the earth it is moist and soft, but when dry is very heavy and compact, with an even smooth surface; but it will not break between the fingers, nor stick to the hands. It raises a great effervescence with aqua fortis, and when thrown into water makes a slight hissing, and after a little time breaks into small lumps. When burnt it becomes very hard, and of an agreeable reddish colour, and will make good bricks when mixed with a proper clay.

The Pale Yellow LOAM is of a loose spongy texture, and consists of small whitish sand with a pale yellow clay. It is pretty tough in the stratum as well

as moist, but when dry it becomes firm and hard, and is spangled with talc. It will not break readily between the fingers, nor stick to the hands, nor yet make any effervescence with aqua fortis: when thrown into water it makes a very little hissing, and soon falls into a loose powder. It is proper for making fine red bricks.

The Yellowish Brown LOAM has a very loose texture, and is composed of yellowish sand with fine brown clay. It will not effervesce with aqua fortis, but it makes a very small hissing when thrown into water, where it moulders into powder after some time. Mixed with ashes it is greatly used near *London* for making bricks.

The Reddish Brown LOAM consists of a hard whitish sand, and a reddish brown clay. It is pretty firm in the stratum, and when dry becomes very hard and heavy. It will not effervesce with aqua fortis, and it hisses but little when thrown into water, where it falls into powder after some time. This Loam serves for making bricks in many parts of *England*.

The Red Sandy LOAM consists of fine pale yellow sand, and a bright red clay mingled with fragments of a very red iron ore, and a great deal of reddish dusky spar. While it is moist it is quite loose, and of a very deep red; but when dry it is of a pale red, and of a very loose texture, for which reason it crumbles to powder between the fingers. It will effervesce with aqua fortis, and burns to a fine florid red. The land composed of it is very proper for rye, barley and pease.

The Brittle Brown Sandy LOAM is an earth partly sandy and partly stony, and when dry it will not keep together in a lump, the texture being so loose and spongy. It makes a brisk effervescence with aqua fortis, and hisses pretty much when thrown into water. Those lands that consist of this are accounted poor and barren.

The Greyish Brown Sandy LOAM is composed of small white sand mixed with pebbles, and it is full of cavities which are smooth and glossy at the bottom. It is pretty tough and very heavy, and has a rough rugged appearance,

appearance, without any dust on the surface. It does not readily crumble to powder, nor does it stain the hands. It makes little or no hissing when thrown into water, nor does it effervesce with aqua fortis. Land consisting of this is very good for barley.

The Heavy Yellowish Brown Sandy LOAM is composed of a great number of different hard particles; a brown gritty stone, a yellow sand, pieces of spar, and a very glittering bright white sand, with a brownish spongy earth. It is hard, heavy and somewhat tough, and in dry seasons breaks into very large masses, though it is of a very brittle loose texture. It is very dusty and hard when dry, and very sticky in wet seasons, which renders the walking on it very slippery and troublesome. It makes a considerable effervescence with aqua fortis, and burns to a pale red with very little hardness. Some of these last are more properly called Moulds than Loams, though they are placed in the same class.



CH A P. XXII.

Of SAND-STONES, ROCK-STONES, MARBLE and ALABASTER.

THE Bright White Brittle SAND-STONE is coarse, harsh and rough, and of a loose porous texture. The surface is of a dusky, dead white; but immediately after it is broken it glitters pretty much. It is composed of a large angular crystalline grit, which is very hard and firm in the mass; but when in small pieces as soft as loaf-sugar, and falls into a white sand like powder. Water, when poured thereon, will immediately sink through it, though it will strike fire with steel, and will soon blunt the workmen's tools. It makes no effervescence with aqua fortis; but it burns to a beautiful pale red. It is used in building, and will bear the weather pretty well; but it will not take a polish. They build houses with it in *Northamptonshire* without mortar.

The Dull Greyish White Brittle SAND-STONE is coarse, rough, and of a loose texture. It is pretty heavy, without splendor, and is composed of a large irregular grit, mixed with a soft loose substance in the form of powder. When examined with a microscope, it appears to consist of an angular oblong transparent large grit, which adhere together in very few places; but the pores are filled up with a whitish powder, while in the earth it is very moist and crumbly; and is much used in building, because it cuts very easily. In some places it is made use of for carving the coats of arms that are placed before the houses. When water is poured thereon it will become wet through; but it will hardly strike fire with steel, and yet it will make a violent effervescence with aqua fortis. It burns to an almost white flesh colour.

The Hard White Dull SAND-STONE consists of crystalline grits that are not very pure; but they are cemented together by a finer crystalline substance. It is very coarse and rough, and of a close compact dense texture, it being very hard and pretty heavy. It is penetrated by water very slowly, and will not readily strike fire with steel; but it ferments very strongly with aqua fortis, and burns to a pure white. It is common in *Dorsetshire*, and does not lie so deep in the earth as many others. It is a very good stone for building.

The Loose Dull Whitish SAND-STONE is very coarse and pretty heavy; it is composed of a very hard roundish grit cemented by an earthy spar. It is not very hard in the mass, and when in small pieces it will crumble into powder between the fingers, and when water is poured on it will ready readily penetrate its surface. It will not strike fire with steel, but it will effervesce violently with aqua fortis, and burn to a reddish white. This is known in *London* by the name of *Portland Stone*, where it is much used in building. It is so soft while in the earth that it is usually cut into a proper form on the spot, for afterwards it becomes considerably hard.

The Hard Greyish SAND-STONE is composed of grit of an oblong angular shape, many of which are purely crystalline and very bright and glittering when viewed

viewed through a microscope; but to the naked eye they appear like shining specks scattered here and there. The grits themselves do not at all cohere, but they are cemented together by an earthy spar. It will not crumble when broken into small pieces, nor is it at all dusty; likewise water poured on it penetrates its substance very slowly. It will not strike fire with steel though it cut with some difficulty; but it will make a violent effervescence with aqua fortis, and burn to a white. This is what is called in *London*, *Purbeck Stone*, and there are often shells contained therein. It is a good stone for building, but will take no great polish.

The Brittle Brownish White SAND-STONE is very coarse, rough and of a loose texture, being somewhat porous. It consists of large angular grit, slightly cemented together by an earthy spar; when reduced to small pieces it readily crumbles between the fingers, and sticks to the hands. Water will penetrate it very freely, and therefore it is no wonder it will not strike fire with steel; but it makes a violent effervescence with aqua fortis, and burns to a pale reddish white. It is common in many parts of the kingdom, but it is chiefly brought to *London* from *Portland*, where it is much made use of in building, because it will stand the weather, though it cuts very easily.

The Brittle SAND-STONE with a round grit, is known by the name of the *Kettering Stone*, though it is not only found about that town in *Northamptonshire*, but at *Ketton* in *Rutlandshire*. It is of a loose texture, and seems to be porous when broken, which is occasioned by the falling out of the inner part of its grit. It is pretty heavy, with but a little brightness, and it consists of a roundish grit laid very closely together, as well as cemented by an earthy spar. In small bits it will crumble between the fingers, but not stick to the hand. It will not strike fire with steel, but it ferments violently with aqua fortis, and burns to a pale whitish colour. It is used in many places for building.

The Greenish White Brittle SAND-STONE is coarse and dusty, and its particles cohere so slightly, that they are continually falling off in powder. It is of

a loose texture, though moderately heavy, and is full of glittering spangles of talc. The grit is pretty large and angular, cemented by a very loose coarse earthy spar. Water poured thereon will readily penetrate through it, and it cuts very easily. It will not strike fire with steel, but it ferments violently with aqua fortis, and burns to a reddish white. It is common in all parts of *England*, and will bear fire better than many harder stones.

Hard Greenish White SAND-STONE is very hard, coarse and rough, though of a firm texture, and it is spangled all over with broad glittering flakes of talc. In some places it is variegated with brown spots, and consists of large grit with irregular angles, lodged in a sort of crystalline cement. It is considerably hard in the mass, but small bits may be reduced to powder between the fingers, and it sticks to the hands. It will not strike fire with steel, nor make any great fermentation with aqua fortis. It burns to a pale reddish white, cuts easily, and takes a pretty good polish. It is sometimes brought to *London*, where it is used in building.

The Brittle Yellowish Brown Glittering SAND-STONE is very coarse, and of a loose texture; but it is considerably heavy, and very full of fragments of talc. It consists of large angular grit, lodged in a dusty cementitious substance, and is soft and brittle in the mass, and will crumble between the fingers in small pieces. It will hardly strike fire with steel, and it makes but a slight fermentation with aqua fortis. It is used in building because it is cheap and easily cut.

The Brittle Pale Brown SAND-STONE is extremely coarse, rugged and rough. It is somewhat spongy and pretty heavy; but it has not so much talc as the former. It consists of oblong grits with obtuse angles, and is cemented by a sort of crystalline substance mixed with earth. It is soft and brittle in the mass, and is easily penetrated by water. It will not strike fire with steel nor ferment with aqua fortis. It is common in the northern counties, and they make whetstones of it which are brought up to *London*, that are much

much used by shoemakers; it also serves for grinding stones.

The Hard Red Glittering SAND-STONE is coarse and rough, though of a very close firm texture, and will bear a pretty good polish. It is remarkably hard and heavy, and of a deep reddish brown colour, with glittering spangles of talc. It consists of large oblong angular grits cemented with a sparry substance. It cannot be rubbed to pieces between the fingers, nor will water so much as penetrate its surface. It is cut with difficulty, and therefore it is no wonder it strikes fire with steel. It makes but a slight fermentation with aqua fortis, and it undergoes little or no change in the fire. This is brought to *England* in large quantities from *Norway*.

The Hard Glittering SAND-STONE of the colour of rusty iron, but sometimes more yellow and sometimes browner, is very beautifully spangled with talc. It consists of a small roundish grit, cemented by a firm deep brown earth, and is remarkably hard even in the smallest pieces, and yet it will not strike fire with steel, though it cuts with great difficulty; nor will it ferment with aqua fortis, though it burns to a deep chocolate colour. It is very plentiful near *Bristol* where there are strata twenty feet thick. It stands the weather very well, and is used in some places for building.

The Soft Brittle SAND-STONE of a brownish rusty colour, is composed of large roundish grit, cemented with a loose ferruginous earth. It will readily crumble into small bits, and is easily penetrated by water. It crumbles to pieces in cutting, and will not strike fire with steel, nor ferment with aqua fortis. It is common in most counties of *England*, and is of little or no use.

The Grey Brittle Dull SAND-STONE consists of large coarse obtusely angular grit, cemented by a loose earthy spar. It is very soft and brittle in the mass, and much more when reduced to small pieces. It will readily split into horizontal plates, and burns to a pale whitish red. It will not readily strike fire with steel, but it ferments greatly with aqua fortis. It will
not

not stand the weather very well, for it is very apt to crumble after hard frosts, though in some places they cover their houses with it instead of tiles.

The Brownish White Glittering SAND-STONE has a moderately smooth and even texture, and is pretty firm, compact and heavy, but it varies in colour on account of the earthy particles that get into the pores of this stone with the water. It is the most bright and glittering of any stone of this kind, and is commonly known by the name of the Flag-stone. It is always found in flat plates from a quarter of an inch to four or five inches thick, and the thinnest of these always lie uppermost. It is considerably hard, and will not break in any direction. It will not easily strike fire with steel, but it ferments briskly with aqua fortis, and burns to a greyish white. It is used in the north of *England* for covering houses instead of tiles; that is, those of the thin sort, for the thicker are employed in paving and building. It consists of grit with blunt angles, cemented with an earthy spar, and interspersed with flakes of bright talc lying in a horizontal direction.

The Greenish Grey Shining SAND-STONE is of a hard, coarse, rough and somewhat spongy texture; but it is considerably heavy, and is full of bright glittering spangles. It consists of large angular grit that lie very close together, among which are dispersed great numbers of fine small very bright flakes of talc, which, with the grit, are cemented with a small quantity of a very pure transparent substance. It will readily split in a horizontal direction, but not into very thin flakes. It does not readily strike fire with steel, and it makes but a slight fermentation with aqua fortis. It is used in some places for covering of houses.

The Yellowish Grey Glittering SAND-STONE somewhat resembles the former; but it is very rough, coarse and harsh, and considerably heavy. It is spangled very beautifully with talc, but will not split so readily as the former. It consists of large grit with obtuse angles, which lie pretty close together. The spaces between them are filled up partly with a crystalline,

line, and partly with an earthy spar. It is very hard in the mass, and will not easily crumble in small bits : it will not readily strike fire with steel, but it ferments violently with aqua fortis, and burns to a fine pale red. It is met with in many parts of *France*.

The Hard Purple and White Laminated SAND-STONE is the hardest and most elegant of this class, though it is very rough and harsh. It is of a very close texture and extremely heavy, and the colour is finely variegated with greyish white and purple. The plates or flakes are much thicker than many of the former, and it is extremely bright and glittering, on account of the large quantity of talc contained therein. It splits very easily, and is composed of fine glittering grit, cemented with a pure shining substance. It is extremely hard, and consequently will strike fire with steel ; but it will not ferment with aqua fortis. It is common in *Italy*, where it is used for pavements.

The Blueish Glittering SLATE-STONE is pretty fine and smooth, and of a close compact texture. It is extremely heavy, and full of talky particles, and more easily cleaves into plates than any of the former, which are generally about one tenth of an inch thick. It consists of small irregular sharp grit, which is often entirely blended with the cement, which is of the same crystalline substance with itself, though debased by a mixture of earthy particles. It is extremely hard, strikes fire with steel, and ferments slightly with aqua fortis. This stone is common in *Italy*.

The Dense Dull Whitish ROCK-STONE is moderately fine, but of a very irregular texture. It is composed of a soft whitish earthy spar intersected with flat plates of the crystalline sort. The earthy part of this stone is pretty dense, but not so hard as the crystalline, and there is no grit of any kind. It ferments greatly with aqua fortis, and burns to a blueish white mixed with a little red. This is very common in many counties, and is brought to *London* from different places, where it is used in building.

The Hard Greyish White Dull ROCK-STONE is of a compact texture, with a smooth surface, and is
considerably

considerably heavy. It is composed of no visible grit, and is easily cut; but it will not readily strike fire with steel, and it ferments violently with aqua fortis. It is common in several counties of *England*, and is used in buildings, and stands the weather pretty well: some burn it into a poor coarse sort of lime.

The Hard Porous ROCK-STONE is of a coarse spongy texture, and yet very hard and heavy. It is generally of a greyish white, though it is sometimes brownish, yellowish or black, from the different kinds of earthy particles falling into it with the rain. It has no grit, and is very hard, even so much as to spoil the workmen's tools. It strikes fire with steel, but will not ferment with aqua fortis. It is common in *Yorkshire*, where the strata lie very deep. It is used for building in that county.

The Hard Bright Grey ROCK-STONE is more like crystal to the naked eye than the former, and consists altogether of a sparry substance. It is a very elegant beautiful stone, for it is bright, shining and very heavy, being one pure homogeneous mass. It will hardly strike fire with steel, but it ferments violently with aqua fortis, and burns to a pale blueish red. It is not very common, but there is some of it in *Yorkshire*, where they both use it for building and for burning into lime.

The Hard Bright Brownish White ROCK-STONE is very heavy, and of a close texture, it being a pure homogeneous mass, consisting of a crystalline spar, which in thin plates is a little transparent. It will not strike fire with steel, but it ferments very briskly with aqua fortis, and burns to a pale whitish red. It is brought from *Purbeck* to *London*, where it is used for building and pavements. It is also used in *Northamptonshire* for building and making tomb-stones.

The Dull Yellowish White Hard ROCK-STONE has a close firm texture, with an irregular surface, and is very heavy. It is of a pale dull white colour, with pale yellow veins and spots in several places; but it is not bright, though composed of crystalline spar. It will not easily strike fire with steel, but it ferments violently with aqua fortis, and burns to a white colour.

It

It is common in *Dorsetshire*, and sometimes contains shells. It is very useful in building, because it bears the weather very well.

The Dull Hard Brownish White ROCK-STONE generally consists of above half shells, and it is a very coarse harsh stone without any brightness. It will not readily strike fire with steel, but it ferments violently with aqua fortis, and burns to a greyish white. It is brought in great quantities from *Purbeck* to *London*, where it is used for flat pavements.

The Whitish Grey Marble ROCK-STONE is considerably fine, remarkably heavy, and of a fine firm texture. It has a remarkable faintish smell, nearly like that of *Florentine* orris. It has a somewhat sparkling appearance, and is entirely without shells. It is considerably hard, and will bear a pretty good polish; it strikes fire with steel, but will not ferment with aqua fortis. It is found in the *Eastern* countries, as well as *Italy*, and some Parts of *Germany*.

The Yellowish White Flinty ROCK-STONE is very fine-smooth and glossy, and its texture is pretty much like that of common flint. It will hardly strike fire with steel, but makes a very great and lasting fermentation with aqua fortis, and burns to a greyish or blueish white. It is common in some parts of *England*, and is known by the name of the Rag-stone and Lime-stone. It is generally free from clefs, but when there are any, the sides are always covered with a crystalline spar. It is used in the pavements of streets.

The Brownish White Flinty ROCK-STONE is in some Parts of *England* called Chert or Wern, has a very compact firm texture, and is considerably heavy. It has sometimes veins and spots of red, white or black. It breaks with an even glossy surface, like that of flinty pebbles; and it strikes fire with steel, but makes no fermentation with aqua fortis. It is often found among other strata of stone, and Dr. *Woodward* mentions one of three feet thick in *Yorkshire*.

The Blueish Flinty ROCK-STONE is very soft and smooth, with a close even texture, and is considerably heavy and hard. It has sometimes blueish
white

white veins, and is found in most counties of *England*. It strikes fire with steel with some difficulty, and makes a strong and lasting fermentation with aqua fortis. In some places it is burnt into lime, which is very good.

The Hard Blueish ROCK-STONE is very rough, and is generally full of shells or spar. Its texture is firm, and it is extremely heavy; it will not readily strike fire with steel, but it ferments violently with aqua fortis, and burns to a pale whitish grey. It is brought from *Purbeck* to *London*, where it is used in pavements. It is hard to cut, and therefore not much used in building.

The Brownish Blue Dull Hard ROCK-STONE is coarse and rough, and pretty heavy. It is generally variegated with lines and spots of a pale red and of an opaque white. It will not strike fire with steel, but it makes a strong and lasting fermentation with aqua fortis, and burns to a pale blueish white. It is called in *Leicestershire* the Blue Lime-stone, for it makes good lime.

The Dull Pale Red ROCK-STONE is pretty fine and smooth, of a firm texture, and considerably heavy. It is variegated in most places with lines and spots of a pale red, or of an opaque white, which generally make a stratum either above or below it. It will not readily strike fire with steel, but it ferments violently with aqua fortis, and burns to a very pale whitish or greyish red. It is used for building walls in some places, and is also burnt to lime.

The Hard Shining Red ROCK-STONE is very heavy, and is spangled in many places with small bits of a very glossy spar. It is extremely hard, and will take a good polish; it will not readily strike fire with steel, but ferments violently with aqua fortis, and burns to a pale red. It is imported from *Sweden*, *Norway* and *Denmark*, and is used in pavements; it is also to be met with in *Yorkshire*. That of *Norway* contains fine strait shells, but that in *England* is without them.

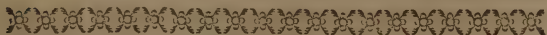
The Green and Red Variegated ROCK-STONE has a rude irregular structure, and is but coarse for one of this class. However, it is not porous, and is pretty

pretty heavy, and interspersed with blotches and soft uneven lines of a fine paler green spar, as well as a few fragments of a white and semi-transparent one. Those that are white appear to be blended among the matter of the mass. It will not readily strike fire with steel, but it ferments violently with aqua fortis, and burns to a pale yellowish white. It is found in the lead mines of *Derbyshire*, but is of no use.

The Hard Black Dull ROCK-STONE has a close firm texture with a smooth surface, is pretty heavy, and extremely hard; but has no gloss, except a few shining specks in some places. It is not unlike black marble, but will not readily strike fire with steel: it ferments violently with aqua fortis, and burns to a fine blueish white. In *Leicestershire* it is burnt into lime.

The Hard Black Shining ROCK-STONE is somewhat coarse, but extremely hard, very glittering, and remarkably heavy. It does not ferment with aqua fortis, and it burns to a pale brownish red. It is found in *Derbyshire*, but is hitherto of no use.

The Soft Dull Black ROCK-STONE has a pretty smooth surface, but no very firm texture. It is very heavy, but has not the least brightness. It has somewhat the appearance of slate, though it will not cleave; nor will it strike fire with steel, nor yet ferment with aqua fortis. This is known every where by the name of Rag-Stone, and is more properly so called than the yellowish white one before mentioned, because when broken it has a ragged appearance. This is used as a whetstone all over *England*, for common knives and carpenters tools.



C H A P. XXIII.

Of S L A T E S.

THE Brittle White SLATE-STONE has a pretty close texture, and is considerably heavy, tho' dull. It consists of various plates from one sixth of an inch to an inch thick, and will split pretty easily. It

It will not strike fire with steel, and it ferments strongly with aqua fortis. It is very common in *England*, and particularly in *Northamptonshire*, where it lies near the surface of the ground. It is made use of to cover houses.

The Purple SLATE is a fine beautiful kind, and is pretty heavy. It is firm and compact, and the colour is a fine pale purple, glittering all over with small glossy spangles, which are very bright, and so minute that they are not to be seen distinctly without a careful examination. It consists of very thin plates or flakes laid evenly upon each other. It will not strike fire with steel, nor ferment with aqua fortis; but it is greatly valued as a covering for houses in the northern counties of *England*, where it is found.

The Common Blue SLATE is almost universally known, and is a very useful stone. The texture is fine and smooth, and it consists of even plates laid close upon each other, and will readily split. It will not strike fire with steel, nor ferment with aqua fortis. It is used almost all over *England* for covering of houses, and is much better than tiles.

The Brownish Blue Brittle COAL-SLATE is always to be met with in coal-pits. It is a coarse smooth brittle stone, of a compact texture, and very heavy. The colour is sometimes blue, but mostly black; and it is remarkable for containing vegetables of the fern kind, like those that are found in *America*. This is of no manner of use.

The Greyish Black Brittle SLATE, by some called SHIVER, is of a very loose open texture, though pretty heavy; but the structure is regularly plated, and the plates seldom cohere to each other. It is very soft, and is readily penetrated by water. It will not ferment with aqua fortis, and it burns to a faint red. It is common in the northern counties of *England*, and is made use of for manuring land, in the same manner as marl. Upon examination some of it has been found to contain a considerable quantity of alum, and perhaps it might be made use of advantageously for the procuring of that salt.

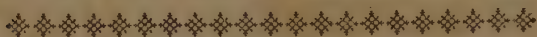
The Greyish Blue Sparkling SLATE has a very compact texture, but somewhat uneven, and consists of irregular plates, which will split into those that are very thin. When large masses are found, they are often bent and undulated, and towards the upper part of the stratum are frequently observed to be defective. They are composed of regular oblong fibres, which are all very bright and glittering when the mass is just broken, having somewhat of the appearance of talc. It will not strike fire with steel, nor ferment with aqua fortis; but it burns to a yellow spangled mass. There are large strata of this in some of the counties of *England*, and it is sometimes found on the sea-shore. It is often used as a whetstone to give a good edge to tools.

The *Irish* SLATE is the most soft and brittle of all this class, it being coarse, rough, and of a crumbly texture; but it is pretty heavy, and of a brownish black. It consists of a multitude of thin plates laid evenly upon each other, and splits very easily. It will not strike fire with steel, nor ferment with aqua fortis; but it will burn to a strong bright red. It is somewhat of the nature of alum, and is very common in *Ireland*; it is also found in *Somersetshire* and other parts of *England*, where it always lies near the surface of the ground in a very thick stratum. It is used in medicine against bruises, and is given by some from one dram to two in curing quartan agues; but its principal use is for internal bleedings.

Boet tells us there is a great variety of colours in these Slates; for some are of an ash-colour, others of a whitish ash-colour, and others again are green, red, blue, yellowish, or black. Some are found with the boughs of trees represented in them, as if they had been painted. In some of the ash-coloured kind there seems to be large quantities of heath of a dusky colour, that could not be more elegantly painted by the most skilful artist. This is found in a river not far from *Florence*, from whence *Boet* had a specimen of this stone. Near *Wersburg*, at a village called *Somberg*, in *Franconia*, there are found some of these stones painted like heath, which the inhabitants call Water-stones.

stones, because they are met with under the water. They are soft, fat, and smooth, like hard soap, which they resemble in colour.

At *Isleb*, in the County of *Mansfield*, there is found a black Slate, which has the images of various fishes of a black or yellow colour; and they appear to be so finely done, that the very scales may be seen. *Boet* had one that contained the figure of a perch of a brass colour, but the rest of the stone was black.



C H A P. XXIV. Of M A R B L E S.

THE PARIAN MARBLE is so called because it was brought from the island of *Paros*. It is of a white colour, extremely hard, and takes a very fine polish. It has a firm, compact, close texture, and is considerably heavy; and its extraordinary whiteness has sometimes a bluish cast, with blue streaks of different breadths. It is not very hard to cut, and therefore is in great esteem among the statuary. It consists of pretty large particles with flat surfaces, but much smaller and more regular in their size and shape than those of the alabaster kind. It will not strike fire with steel, but it ferments violently with aqua fortis, and when burnt is as white as snow. Some say this marble receives its name from *Agoracritus Parius*, who first carved a statue of *Venus* out of it. It was called by the ancients *Lychnites*, because they made use of the light of lamps in getting it up; for *Lychnis* in Greek signifies a lamp: but more probably it was so called from its extreme brightness when polished.

The Hard White MARBLE called Carrara by the Moderns is whiter than the *Parian*, but is not of so great value, because it is more hard to cut, and will not take a fine polish; however, it is used for building, as well as to make statues. It has a more firm and close texture than the former, and is very heavy; besides,

Briony Root Stone
312.



Fungites 312



Apricock Stone 312.



Pear Stone 312.



Mulberry Stone
312



besides, it has greater transparency than any other white marble. It consists of small glittering particles, many of which appear to have flat surfaces, and consequently lie close together; and it is supposed to consist of a perfectly white spar. It will not strike fire with steel, but it ferments violently with aqua fortis, and burns to a pure white. This marble is found in *Italy*, from which country large quantities are brought to *England*.

The Hard Pale Yellow Glossy MARBLE is of the same colour throughout, and is considerably heavy, with a close firm texture. It is very fine and smooth, and between the colour of honey and *Venice* turpentine. It will readily break in any direction into a smooth glossy surface. It will not strike fire with steel, nor ferment greatly with aqua fortis; but it burns to a fine pale red. It is in pretty good esteem in *Italy*, though not frequently brought to *England*.

The *Numidian* MARBLE of the antients is hard, shining, and of a blueish colour, and is very remarkable for its hardness. It will bear an extremely fine polish, on account of its compact even texture. It is not at all transparent, unless in very thin pieces. It will not strike fire with steel, but it ferments greatly with aqua fortis, and burns to a pure white. It is found in *Italy*, *Spain*, *France*, and *Germany*; and is a fine, strong, durable marble, though not in great esteem.

The Black *Namur* MARBLE is very fine and smooth, having a close firm texture, and is very heavy. It is full of fine small glossy particles, which look like so many spangles. It will not strike fire with steel, but it ferments violently with aqua fortis, and burns to a pure white. It is a useful marble, though not much esteemed.

The *Cbian* MARBLE is of a black colour, and is very fine and hard. It is used in *England*, as well as in other places, for a touch-stone; and is in great esteem with the goldsmiths for that use, it being the best of this kind. It is perfectly smooth when broken, but it is very dull, and does not shine at all. It appears to be one pure, unmixed, homogeneous mass; and
cuts

cuts with difficulty, but very smoothly. It will not strike fire with steel, but ferments very strongly with aqua fortis, and calcines to a pure white. It was formerly brought from the island of *Chios*; but we have it now from *Italy*. It is capable of a very high polish, infomuch that it has been used instead of a mirror.

The *Lydian* STONE of the antients is a hard black Marble, in the shape of columns, and is called Basaltes by *Boet*. It is reckoned among the Marbles by *Pliny*; and indeed it is the hardest of this kind, for a file will not touch it. It is also called Basanus, from a *Greek* word that signifies to examine, because this was the touch-stone of the antients. There was a very large piece of this in the Temple of Peace, erected by the Emperor *Vespasian*, which represented the river *Nilus* with sixteen children playing about him, by whom was signified the increase of that river to so many cubits in height. It is now met with in various parts of *Germany*, and particularly in *Silesia*; but the greatest quantity of it known is the *Giants Causeway* in *Ireland*, which appears so regular that it was at first taken to be a work of art. This Marble is of a very fine, smooth, even texture, and of so glossy a black that it resembles high-polished steel, without any foreign matter. It is always found in one smooth homogeneous mass, but not in quarries like other Marbles; for it always stands upright in regular columns, consisting of a great many joints, one of which is exactly placed and fitted to the other. A vast number of these are so regularly put together, and joined by their sides, that they seem to have been placed so by a very skilful workman. Many of these columns make large pillars, some of which are at small distances from each other. The single columns are all angular, and they consist of from four to seven angles; but the first are most uncommon. *Boet* informs us, that the Castle of *Stolpa*, belonging to the Elector of *Saxony*, three miles from *Dresden*, is built of a congeries of this stone, as well as the adjoining buildings; and that pieces are got from thence with great labour, which the gold-beaters and blacksmiths make use of instead of anvils. They are cut in the same manner

as we do Marble, with the assistance of sand and water; but it takes a great deal of time to perform this work. He farther adds, that it is met with of the thickness of a moderate beam, and that the columns are so joined together that it seems to be done by a skilful carpenter. These columns consist of from four to seven sides, as was just observed, and its shape is like that of an upright beam, smooth to the touch, and of an iron grey colour; and it is as heavy and hard as a diamond. It will not strike fire with steel, which must be on account of its smoothness, for it is certainly hard enough for that purpose; likewise it makes little or no fermentation with aqua fortis. This stone may be made use of on various occasions, and it is well known to make the very best kind of burnishers for polishing silver.

The *Lacedemonian* MARBLE of the ancients is of the green kind, and is taken notice of by *Pliny*. It is different from the *Ophites*, because that is variegated with spots like serpents, from whence it took its name, for that word signifies a serpent; besides, the columns that are made with this last are always very small. *Boet* informs us that the *Lacedemonian* MARBLE is variegated with small spots of lighter green. The pavement of the cathedral church of *Pisa* in *Italy* is adorned therewith, as also the walls in mosaic work. There is also another of this kind, of a dark green, which is finely painted with crosses of a lighter colour, which are so fine that common spectators would take them for the effect of art. *Boet* has seen pieces of this kind as large as a man's head. This Marble has a close compact texture, and is very hard and heavy. It is of a fine bright green, and takes a very good polish. It will not strike fire with steel, but it ferments violently with aqua fortis, and burns to a pure white. It was first brought from *Lacedemonia*, afterwards from *Egypt*, and is now found in *Germany*, *Sweden*, and *England*. There is said to be a stratum of it near *Bristol*, and many in *Wales*, where it may be had in any quantity.

The *Derbyshire* MARBLE is of a whitish brown colour, and has a fine close texture. It consists of a multitude

tude of granulæ which cohere closely together, that are all nearly of a parallelopiped figure. It will not strike fire with steel, but it ferments violently with aqua fortis, and burns to a pure white. It is so full of marine substances, that four fifths of the whole mass seem to be composed thereof; it is particularly full of entrochi, which are a sort of shell of an oblong round form, furrowed on the outside as if it was divided into joints, marked with a star at the end, which are supposed to be part of the Star Fish; but this is uncertain. They are of all sizes, from the thickness of a large pin, to half an inch or more. They will take a very elegant polish in the mass, and are much used for chimney-pieces, tables, and the like. It is found in vast quantities in *Derbyshire*, and some will not allow it to be Marble, but call it the *Derbyshire Stone*.

The Green MARBLE thick set with small sea shells is of a very beautiful kind, and will bear a very fine polish. It is of a delightful bright green; but does not sparkle. The roundish black lines, and pale brownish white specks that are found in it, are thought to be small sea shells, filled up with an impure white earthy opaque spar; but be that as it will, it is a very elegant curious Marble. It ferments violently with aqua fortis, and calcines to a pure white. There are very large quarries of it in *Germany*, *Bohemia*, and some parts of *France*, where it is used in the ornamental parts of buildings.

The Greyish Green MARBLE thinly set with shells is somewhat coarse and rough, and of an irregular and pretty firm texture, moderately heavy, and considerably hard. The Gothic columns made of this, to be seen in some ancient buildings, have been thought to have been cast in moulds, from whence it obtained the name Fusible Marble; but this is an evident mistake. It is of a dull dusky greyish green colour; and will ferment violently with aqua fortis. It is found in *Derbyshire*, *Dorsetshire*, and *Essex*.

The Hard Greyish Black CORALLOIDE MARBLE has a very fine smooth even texture, and is considerably bright and sparkling; but does not seem to consist

consist of a homogeneous mass when broken, but of many closely-compacted particles. It abounds with a sort of coral called Porus, set at small distances and in all directions: they are generally about an inch and a half long, and three quarters of an inch broad; and they are composed of longitudinal plates, which are very fine, thin, and of a snow-white colour. In the most perfect specimens there are processes like wings, of a close irregular net-like texture, expanded on each side near the top, and of this sort of texture the whole body is full; the interstices are filled up with a greyish white spar, and form a very beautiful figure. It is found in considerable plenty in *Derbyshire*, and according to Dr. *Woodward* in *Wales*. The tomb of Sir *Thomas Gresham* in great *St. Hellen's* church is built with it.

The Black CORALLOIDE marbled with shells is of a very close firm even texture, and is very hard and pretty heavy; it will bear a very fine polish. It is variegated with a Coralloide Porus not unlike the former, but smaller. There are also great numbers of large sea shells, of the turbinated and bivalved kinds, lodged in various directions, and of a clear bright white. The cavity of the porus and shells are all filled up with the black substance of the marble; but they retain their shape in a very perfect manner. It ferments violently with aqua fortis, and is common in *Ireland*, from whence it is brought to *London*.

The Purple and White Variegated MARBLE is generally pretty fine, with white veins, spotted and variegated with purple. In some blocks the purple makes the ground, and the veins and spots are white; there are also blotches of other colours, as pale red, pale brown, yellowish, greenish, and yellowish brown. The different substances which compose this Marble are generally distinct masses, particularly those of the purple and white kind. The whitest is most pure, and therefore is hardest, brightest, and most transparent. The pale red is next, the purple next to that; but the brownish, greenish, and yellowish, are very earthy, and almost perfectly opaque. There are silvery particles in this Marble, which are supposed to be a

very pure spar. This is a common Marble in *Italy*, and great quantities of it are brought to *England*.

The Brown and White Brittle MARBLE is the softest of this class, and has a pretty coarse texture; but it is considerably heavy, and of a pure snow white, finely variegated with slender lines, and veins of a deep brown earthy colour, and in some places there is a faint cast of pale red: when broken, glittering particles appear as in the former, which are disposed in small flakes. The white parts or ground are extremely like the finest loaf-sugar, and it is so soft it may be cut with a knife. Water will readily soak through it, and it makes a violent effervescence with aqua fortis. It is common in *Italy*, and serves to make chimney-pieces.

Hard Variegated Red and White MARBLE is very fine, remarkably heavy, and is somewhat of a blueish ground, finely variegated with red brown and yellow veins. It is very glittering in many parts, and will take a very fine polish. It will not strike fire with steel, nor ferment greatly with aqua fortis. It is a beautiful Marble, and is found in great plenty in *Devonshire*, from whence it is sent to *London*.

The Blue and White Variegated MARBLE has a large rough grain, is moderately heavy, and is of a blueish white, or of a fine bright pearl colour, variegated with broad veins of a dusky blue, which often make up the greatest part of the Marble. The white parts when broken appear bright and sparkling, but their texture is loose. The blue is of a smooth texture, and extremely dull. It is moderately hard, and takes a very good polish. It ferments violently with aqua fortis, and burns to a greyish white. It is common in *Italy*, from whence large quantities are brought to *England*, where it is used for monuments.

The Pale Brown MARBLE with white and red veins has great variations, both with regard to the ground and the veins. The texture is pretty fine, close and smooth, and it is considerably heavy. The veins are sometimes of a blueish white, without any other mixture, and in some they are only red. The red is of all degrees, from the brightest colour to the purple

purple of porphyry. It is considerably hard, and takes a very beautiful polish. It ferments violently with aqua fortis, especially in the red and white veins. It is a common *English* Marble, and there is great plenty of it in *Cornwall*, *Devonshire*, and *Wales*. It is used in *London* for tables.

The Brown MARBLE variegated with white and black is pretty fine and smooth, though subject to cracks and flaws. It is moderately heavy, and the brown colour is variegated with very beautiful whitish and black branded veins of various figures: sometimes it is difficult to determine whether the white or brown is the ground. The brown is of different degrees of colour, and is disposed in a very odd manner; for it sometimes with a black seems to resemble rocks, clouds, rivers and landscapes. It is common in many parts of *Italy*, where it is in good esteem for ornamental works.

The Hard Brown MARBLE variegated with white is the hardest of this class, and is remarkably heavy. It generally consists of only two colours, yellowish brown, and a dusky white; but they are in many different proportions, and the veins are composed of very different shades. They sometimes resemble the windings of rivers, and seldom any thing else. It ferments but little with aqua fortis, nor will it readily calcine; it is very hard to work, therefore is not much in use; it is found in *Italy*, but not very common.

The Yellow and Purple Variegated MARBLE is a very curious kind, and the ground is of a beautiful pale yellow, with fine purple veins; there are others that are dark brownish, blackish and white. The structure is smooth and even, and it will bear a very elegant polish. It will ferment somewhat briskly with aqua fortis; and when calcined turns to a beautiful pale red. It is found in *Italy*, and with us bears a very great price.

The Blue and Yellow Variegated MARBLE would be very valuable if it would admit of a fine polish; but as it does not, it is not in great esteem. The ground is somewhat coarse, and the texture loose and open. The ground is of a deep yellow, mixed with

a fine blue; which in some places is so deep as to be almost black, and in other places so light that it looks like a pale grey. It is common in *Spain, Italy, and Africa.*

The Black MARBLE with white veins has a very firm texture, and is of a fine deep black, variegated with narrow white veins, running generally strait and even. It is pretty hard, and will bear a good polish; and when broken one way it is very bright and sparkling. It ferments but little with aqua fortis, and calcines to a dusky grey: it is common in *Italy*, and is used with us for chimneys and tables.

The Blueish Black Hard MARBLE with snow-white veins has a somewhat rough and harsh texture; but is considerably hard, and will bear an excellent polish. It is somewhat bright and glittering when broken in the black part; and the white veins glitter greatly. It ferments violently with aqua fortis, and when calcined is of a mixed grey. It is common in *Italy*, and is brought to us from *Leghorn.*

The Black and Yellow Variegated MARBLE has a very fine close texture, and is very heavy. The black is deep and variegated with a great number of yellow veins. It will bear a very fine polish, and then the yellow veins look like gold; and when there is any white they appear like silver. There are great quantities of this Marble brought from *Italy*, because it is of very great use with us, and highly esteemed.

The Black MARBLE with white and red veins is of an irregular but close texture, and is considerably heavy. The ground is black, and sometimes inclines to blue, and the variegations are chiefly of a clear bright white; but there are some of a beautiful red. Sometimes the white part is so great that it is hard to determine whether the white or black is the ground. The red veins commonly appear of a granulated structure; and the whole is very hard, and will bear a very fine polish. It will not strike fire with steel, but it ferments pretty briskly with aqua fortis, and burns to a mixed grey. There is a great deal of this Marble in *Ireland*, from whence it is sometimes brought, though very rarely.

The Black MARBLE, with red white and yellow veins, is pretty coarse and rough, though of a firm texture. The ground is of a deep black, which is beautifully variegated with all degrees of red, yellow and white, dispersed in irregular veins. It is brightest in the white part, and the red and black sparkle, though very little; but in the red it is scarcely perceivable. It takes a pretty good polish, and ferments though but little with aqua fortis, except in the white veins.

The Green MARBLE variegated with white veins was in much esteem with the antient *Romans*, and it is called by *Boet* the *Augustan* and *Tiberian* marble, though he makes it the same as the *Lacedemonian*. It has a firm compact texture, and is remarkably heavy, and the green and white are of such different degrees, that they make a very agreeable variegation. Besides these, there are spots and veins of a blackish colour, and the whole is so hard that it will bear a pretty good polish. It ferments briskly with aqua fortis, except where it is green and flaky; and is brought from *Egypt* and other places.

The Greenish Black and White Spotted MARBLE is the black Ophites or Serpent-Stone of the antients. It was so called, because it had spots in the form of serpents; for the name was owing to the figure of the spots and lines, and not of the stone itself. *Boet* informs us, that it is sometimes of a greenish white with black spots, such as that of *Zeblick* in *Germany*, and *Misnia*. *Dioscorides* affirms, there are several sorts of Serpent-Stones that are distinguished by the variety of their colours, which, however, he reduces to three kinds, one of which is heavy and black, the other with ash-coloured spots, and the other with white lines. *Pliny* has only two sorts, one soft and white, of which vessels were made in his time, and the other black and hard. The Ophites of the ancients served only to make small columns; but as *Boet* acquaints us, that which has the same name at present serves for large columns, and it is found in many places of *Italy* and *Germany*. However, he mentions another sort, which is ash-coloured, blackish or greenish, curiously

variegated with green or black spots, and sometimes with black or white lines. They made spoons and cups of it in his time ; but he thinks it was too soft for that purpose. Of the black Ophites there are now to be seen many small columns, and particularly in the church of *St. John Baptist* at *Pisa*, and this the common people call the *Egyptian Viper*. It is of a livid colour with black spots ; and there is another ash-coloured Ophites in the same place, which they call the *Syrian Granite*. The ground of this is whitish, and it is spotted with black. But this now under consideration is a very beautiful and pretty hard marble, of a firm texture, and remarkably heavy ; the ground is a very fine green, variegated with small black spots and irregular lines, and sometimes with those that are white. They are sometimes pretty large, and half blended with the general substance of the mass, and sometimes there is the blush of purple throughout the whole. It ferments violently with aqua fortis, and burns to a mottled grey. This marble is now found in various parts of the world, and particularly in the islands of the *Archipelago* ; there is also a sort of it in *Wales*, which is known by the name of the *Anglesea Marble*.

The Greenish Soft MARBLE, variegated with white and black veins and spots, is the white Ophites of the antients. It is of a pretty fine smooth texture, moderately heavy, and, when pure, of a very elegant pale green, with spots, clouds and lines of a fine deep black and whitish green, which is sometimes entirely white. It is soft and easily cut, but looks very bright when wrought. It ferments violently with aqua fortis, and burns to a dusky grey. It is found in *France*, *Italy* and *Germany*.

The Ash-coloured MARBLE with small black spots is the Tephria and grey Ophites of the antients. It is a fine smooth marble, pretty firm and compact, and considerably heavy. The ash colour is lively and beautiful, and the black spots of irregular figures, but much of the same size, that is, the sixth part of an inch in length. It is pretty hard, and takes a fine polish. There is a great deal of this in *Germany*, but

it is not so good as that of the antients, which is brought from *Ethiopia* and *Egypt*.

The Greyish Brown MARBLE with bright green spots has an even texture, is considerably firm, and very heavy. The spots are small, and generally of an oblong figure, and it will take a very fine polish. The green parts especially ferment greatly with aqua fortis, and burns to a pale mottled grey. It is common in *Egypt* and *Arabia*, and is said to be met with in *England*.

The pale grey MARBLE with green spots and veins is extremely firm and very heavy, and in some places slightly tinged with a very faint red, and in others with a colour that is nearly white. It is variegated with a very beautiful pale green, consisting of small oblong irregular spots, and sometimes of narrow uneven veins. It is very heavy, and will bear a beautiful polish. It is common in *Germany*, and Dr. Woodward takes notice of a specimen found on the sea shore in *Cornwall*.

The Red MARBLE with white and gold veins is the *Theban* marble of the antients; and Boet tells us, that it has gold drops or spots, and is called Brocatello by the *Italians*, because it appears like cloth composed of gold and silk, which we call Brocade. There are said to be small pillars of this under the pulpit of the episcopal church, and in St. John's church at *Pisa*. It is a very beautiful marble, and of a very smooth regular texture. The red is variegated in some places only with white, and in others only with yellow or gold colour; and these are very large and broad in some places, and very narrow in others, for they generally make up almost half the mass. It is found in *Egypt*, *Italy*, *Germany* and *England*; but the *Egyptian* is finest, and the *English* the worst.



C H A P. XXV.

Of ALABASTER, PORPHYRY and GRANITE.

THE Snow-white Shining ALABASTER is that called the Lygdine by the antients. *Boet* informs us, that it is extremely white, and is found in *Taurus* in very small pieces, that are only large enough to make dishes and the like; but it was formerly brought from *Arabia*. It is not very compact, but it is heavy, and consists of a multitude of broad flat large particles, which are very bright and perfectly white. It cuts very freely, and is capable of a fine polish. There are very large strata of it in *Arabia*, *Egypt*, and many parts of *Italy*; but it is seldom brought over to *England*.

Whitish Yellow ALABASTER, of a soft consistence, is called by *Boet* the Phengites of *Pliny*, who affirms it was found in *Cappadocia*, and that *Nero* built the temple of *Fortune* with this stone. This stone on the inside in the same manner as paper that is smeared with oil, and is not transparent. He farther adds, that it differs in nothing from common marble but in hardness, and in its shining when polished. It is of a loose open texture, considerably heavy, and nearly of the colour of honey; but the colour is more deep in some places than others. It consists of irregular pieces that lie in tables one over another, though with regularity; however, they all together compose a remarkably bright mass, which is very brittle. Besides the place above mention'd, it has been found in *Germany* and *France*, as well as in *Derbyshire*.

Yellow and Reddish Variegated ALABASTER is the common Alabaster of the antients. It is so soft that it may be cut with a knife, and has the same name in all languages. It is remarkably bright, glittering and almost transparent, and its texture is very loose

loose and open, though it is moderately heavy. The ground is of a fine clear pale yellow, between that of honey and amber, and has the same texture as the Phengites; but is beautifully variegated with crooked undulated veins, some of which are broad and others narrow; some of a pale red, others whitish, and others again of a very agreeable pale brown. It will bear a very fine polish, and consists of large angular sparry concretions. It is not proof against water. It ferments violently with aqua fortis, and burns to a pale grey colour. It was formerly found in *Egypt*, and is now met with in many parts of *England*.

Purple PORPHYRY with pale red and white spots is the Porphyry of the antients, by whom it was placed among the red marbles, of which it was reckoned the chief, on account of its hardness and splendor: when there were any white spots among it, it was called Leucostictos by *Pliny*. It is named Porfido by the *Italians*, and there are two columns of it before the gates of *St. John Baptist* in *Florence*. The texture is not so fine as many of the common marbles, and it always breaks with a rough irregular surface; but it is remarkably firm, compact and heavy, and of a fine deep purple variegated more or less with pale red and white spots, as also a few flaky black spots. The purple is of all degrees, from the colour of claret to that of a violet, and the variegations are generally distinct spots of various sizes. It approaches the nearest to the hardness of a gem, and was always in very high esteem. It is found in great plenty in *Egypt*, which was always famous for this stone; but now it is met with in other places, at least with variations. They will all strike fire with steel, but will not ferment with aqua fortis. This is frequently made use of as a stone for grinding of colours.

The PORPHYRY of the colour of red lead, variegated with black white and green, has the hardness and all the other characters of purple Porphyry; but it excels it in brightness and in the beautiful variegations of the colours. The texture is harsh, rough and irregular, but it is remarkably heavy. The ground is of a bright red lead colour, and in various degrees.

It has very regular green veins, and some that are perfectly white, with a great number of small black specks; but these are never mixed with the green, that make a considerable part of the whole. It takes an exceeding fine polish, strikes fire with steel, and will not ferment with aqua fortis. It is found in the island of *Minorca*, and this might serve for many valuable purposes, if it was imported into *England*.

The Pale Red PORPHYRY, variegated with black white and green, is of a very compact firm texture, considerably heavy, and of a pale flesh colour, often approaching to white. The variegations are in large blotches from half an inch to an inch broad, and now and then disposed in irregular veins. The surface is bright, but it does not glitter, and its extreme hardness renders it capable of a very high polish. The red white and green parts appear to be all tabulated, and the green has a tinge like that of gems, and is the brightest of all, it being nearly transparent. It is found in *Arabia Petraea*, and in *Upper Egypt*. There are also small pieces of it in *Germany* and *Ireland*, and they have been sometimes seen in *Devonshire* on the sea shore.

The Hard White GRANITE with black spots, called in *Cornwal* Moor-stone, is of a large and gross texture, and appears to be a rude, but beautiful mass of variously constructed and differently coloured particles, distinct from each other, though they cohere very strongly. It is considerably hard, and mottled with black and white, among which there are perfectly transparent particles that are very bright, and there are great numbers perfectly black, and others of the colour of brown crystal: some of these intersect, and are divided by other granulae; but others lie parallel with, and others evenly upon them; and others again are quite buried in the substance of the crystalline particles, like flies in amber. Some again are single and thin plates, and others large and broad laid singly on each other. The whole is extremely bright and glittering, and will take a pretty good polish. It strikes fire with steel, but will not ferment with aqua fortis. It undergoes little change in the fire.

fire. There are vast quantities of this in some Parts of *Ireland*, as well as in *Cornwal* and *Devonshire*, where it is found in exceeding large masses on the surface of the ground. It is used in *London* for the steps of public buildings.

The exceeding Hard Red GRANITE, variegated with white and black, is the Syenites of *Pliny*, and the Oriental Granite of the moderns. It is called by the *Italians* Granito Rosso, and of this the obelisks are generally made in *Egypt*. The first that was said to make use of it was *Mitres*, who reigned at *Heliopolis*; and *Sochis* is said to have constructed four of forty-eight cubits each. We learn from *Pliny*, that there were some of these in *Rome* in his time, among which is the great obelisk that was dug out of the *Circus*, and is now placed in the *Lateran* church; there is another also that was in the *Vatican*, and is now to be seen on an eminence placed before a church in the street. Some have imagined they were a composition made up of a great number of small pieces, because they were thought to be too large to be brought by sea: but *Pliny* acquaints us, that they actually were transported to *Rome* in that manner. There was one at *Alexandria* of eighty feet long, that was constructed by order of *Nectabis*, an *Egyptian* King. There are also many others of this kind still to be seen, and which travellers have given us an account of. The texture of this Granite is coarse, harsh and rough, but extremely hard, and considerably heavy. It is of a very beautiful pale red, variegated with white and black. All parts of it are bright and glittering, for it is capable of a very fine polish. It strikes fire with steel, but will not ferment with aqua fortis.

The Pale Whitish GRANITE variegated with black and yellow is found in the island of *Minorca*, where there are vast quantities of it. It is often found on the shores of the island of *Guernsey*, and is used for pavements in the streets of *London*.



C H A P. XXVI.

Of Common Circumscribed STONES.

THE Brown STONE, grey on the outside and divided by partitions, has a very firm compact even texture, with a smooth surface. It is of various sizes, but generally between six and twelve inches in diameter. They are not always of the same shape, but are most commonly roundish, or inclining thereto. They have always a multitude of fine flaws, like those of common flints, which chiefly appear upon breaking them; and they always break in these flaws, which are lined on both sides with an extremely thick crust of grey clay. Besides these narrow cracks, there were originally others, which are now filled up with a pure spar of a pale yellowish white, and pretty transparent. These are always thickest in the centre of the stone, and become thinner and narrower as they approach the surface. The stony matter of this kind is considerably heavy, moderately hard, and will bear a slight polish. It will not strike fire with steel, but it ferments violently with aqua fortis, and turns to a whiter colour in the fire; and the matter which divided the several parts burns to a pure white. It is very common in *England*, and sometimes contains shells, besides a beautiful delineation of shrubs, plants, and mosses.

The Hard Brown STONE with few divisions has not a grey crust like the former, but the colour within is nearly the same. The texture is firm, but the surface rough and irregular; and the usual size is from four to twelve inches in diameter. The shape is different, but it has always somewhat of an oval; and when broken there are small shining sparry specks. The divisions or septa are very few, which appear in the form of shining veins; and there are some that have none at all. It will not strike fire with steel, but ferments greatly with aqua fortis, and calcines to a
greyish

greyish white. It is common in the clay pits between *London* and *Uxington*.

The Hard Blackish Brown STONE with whitish partitions is coarser than the former, but the texture is firm, and it breaks with a rugged uneven surface. It is seldom above six or eight inches in diameter, and often no bigger than a hen's egg, but the shape is nearly round. It is always covered with a pale brown crust, about the third of an inch thick, where it is softer than within. The divisions are very numerous, and always filled up with a whitish spar. The inside of the Stone is of a dusky brown, with irregular variegations of black. It is considerably heavy, and will take a pretty good polish. It will not strike fire with steel, but ferments with aqua fortis, and burns to a pale reddish white. It is found in most parts of *England*, and is common near *London*.

The Hard Brownish Yellow STONE with yellowish white partitions is very firm and hard, with a smooth compact texture. When broken it has a smooth flinty surface, is of various sizes from four to twelve inches in diameter, and generally roundish with somewhat of flatness. It is covered with a deep yellow crust, softer than the substance of the Stone, which will crack when exposed for some time to the air. The septa are pretty broad, running irregularly through the mass, and meeting each other in different directions. They consist of a pale yellow spar; and this Stone is very hard, heavy, and will bear a tolerable polish.

The Hard Greyish Brown STONE with brown partitions is very close and compact, and has a very smooth surface when broken. It is met with from three feet to four in diameter, and the shape is always irregular. It is without a crust, and sometimes appears a little bright. The septa are of a fine deep brown, and are very bright and glossy: the veins, which are few, are very broad; and, though it is remarkably hard, it will not strike fire with steel, but it ferments violently with aqua fortis, and calcines to a greyish white. It is common about *London* and elsewhere.

The Hard Ferruginous Brown STONE with brown partitions is very firm, strong, and of a compact regular texture, with a smooth even surface when broken. It is two or three feet in diameter, is generally broad and flat, and most commonly without a crust. It breaks into thin flakes in a very regular manner, with a great many shining specks. The septa consist of a sparry matter, and are few in number, irregularly dispersed through the Stone. It is remarkably heavy, very hard, and will bear a pretty good polish. It will not strike fire with steel, but ferments greatly with aqua fortis, and burns to a brownish red. It is common on the shores in *Yorkshire*.

The Soft Whitish STONE with brownish yellow partitions is of a very soft and loose consistence, and full of great numbers of empty cracks. It is seldom above eight inches in diameter, and is of a roundish shape. Sometimes it is invested with a crust a little paler than the inside of the Stone, and when broken a few shining specks may be seen. The septa are numerous, and of an elegant yellowish or brown colour, with fine bright pointed surfaces; and they are irregularly scattered through the mass of the Stone. It ferments greatly with aqua fortis, and calcines to a pure white.

The Elegant Crustated STONE, with a blueish nucleus or kernel, is of a very close even texture, and is generally about eight or ten inches in diameter, and of a roundish flattish shape. The crust is about the sixth of an inch thick, and of a pale yellowish brown, as well as the rest of the mass. The nucleus in the centre is usually about four or five inches broad, and about half an inch in diameter. It is of a pale blueish grey, and round it the substance is disposed in regular crusts, which grow thinner as they approach the centre. Those near the centre are commonly brown, and others are intermixed with yellow as they approach the surface. The septa are broad, but few in number; and are of a brownish yellow, placed without any regularity. It ferments with aqua fortis, and burns to a pale red. It is not very common, but it is found in *Leicestershire*.

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The Hard Dusky Brown STONE with very thick partitions has a fine close texture, and an even surface. Its shape has a tendency to roundness, and it is generally between four and five inches in diameter, with a pale yellowish brown crust, though sometimes it has none at all. When broken the surface is irregular, and looks like flint; but it has but few spangles. The partitions are numerous, broad and thick, of a pale brown colour, and pretty transparent. They are all irregular, and this Stone will bear a pretty good polish. It will not strike fire with steel, but ferments most strongly with aqua fortis.

The Hard Greyish Brown STONE, with thick whitish partitions, is different from all the foregoing; for it is divided into angular squares of irregular shapes. The texture is firm and compact, and the surface irregular and rugged. The size is from four to eight inches, and it has a tendency to roundness. It seldom has a crust, and when broken does not at all sparkle. It may be generally observed, that in these sort of Stones the softer they are, the more they are spangled; but the harder, the less spar they contain. The septa are very numerous, thick, and large, and consist of a pure whitish spar. They run every where in various directions, forming a kind of net-work, the meshes whereof are filled with a stony substance of various figures, from three to five corners; for they seldom are six, unless on the external surface. The pieces are of various sizes, from half an inch to an inch and a half in diameter. This stone is very heavy, and takes a good polish; but it will not strike fire with steel, though it ferments violently with aqua fortis.

The Brown Compressed STONE with yellow partitions is generally of a very large size, being from one to three feet in diameter. It is of a broad and flat shape, and seldom above four inches thick. It is sometimes invested with a thin yellowish brown crust, but it is most commonly found naked. It has a reddish cast, which is owing to a slight tinge of iron, though the prevailing colour is a pure brown. It has a smooth surface when broken, but has no shining specks. The partitions consist of fine glittering spar
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of the colour of honey, which is disposed into columns, and is regularly and beautifully dispersed throughout the mass of the stone, dividing it into oblong angular pieces with three or four sides, and from one to two inches in diameter. It is very heavy, hard, and will bear a fine polish; but it will not strike fire with steel, though it ferments violently with aqua fortis. It is common on the shores of *Yorkshire*, *Sussex*, and *Kent*.

The Whitish Grey and very Hard STONE, looking like flint, is of a firmer texture than any of the former, with a pretty smooth even surface. It seldom exceeds six inches in diameter, and always is of a round or oval shape. It is mostly covered with a thickish brown crust, and on the inside it is sometimes very pale, and sometimes mixed with more or less brown. It appears like flint when broken, and has no shining specks. It has but few partitions, and those very thin, and of a very pale brownish white. It is remarkably heavy, and very hard, though it will not strike fire with steel; but it ferments violently with aqua fortis, and burns to a pale greyish white. It is not very common.

Blueish STONE brown on the outside, with white partitions, is pretty hard, with a rough irregular surface; and is of various sizes, from a few inches to two feet in diameter. It is always flattish, being seldom more than six inches thick in the middle, from whence it becomes thinner to the edges every way. It is sometimes invested with a pale brown crust of earthy matter, mixed with a little spar; but it is most commonly entirely naked. Wherever this stone breaks with ease, it is always of a pale brown colour, but elsewhere of a dusky blue or lead colour, with a few shining spangles. The partitions are of a very pure white, though sometimes a little tinged with the colour of brimstone. They are very numerous, and divide the mass into many pieces, which consist of several sides, and are from one to three inches in diameter. It is capable of a good polish, but will not strike fire with steel, though it ferments violently with aqua fortis.

fortis, and burns to a pale dusky red. This stone is very uncommon.

Hard Pale Yellow STONE, with a few thin partitions, is of a pretty firm texture, but the surface is rough and unequal. It is sometimes three feet in breadth, and very flat, for it seldom exceeds two or three inches in thickness. The pale yellow is sometimes mixed with brown, and when broken its surface is pure and regular. It has a few shining spangles in different places, and is sometimes covered with a thin shell of a pale grey earthy matter. The partitions consist of a pale brown spar, disposed in short irregular columns, and generally lie in strait perpendicular directions, dividing the mass into large pieces; and on each side of the cracks filled with these partitions there is often a coat of white sparry earth; for which reason this stone may be easily divided into pieces. It is pretty heavy, and will bear a tolerable polish. It is common in the middle counties of *England*.

Soft Dusky Yellow STONE, with very thick partitions, has a pretty smooth texture, but not very compact: the surface is uneven, and the size is from two inches to two feet in diameter. It is always flat-tish, though generally thickest towards the centre, and thinner at the edges. When it has any crust, it is always a little softer than the rest of the stone; and the disagreeable dusky yellow is mixed with a little brown. When broken it appears in irregular flakes, with a rough surface, on which are a few spangles like talc. The partitions consist of a pale yellow spar regularly dispersed through the stone, and are pretty numerous, many of which are no less than one third of an inch in diameter. It is pretty heavy, though soft; and it does not ferment greatly with aqua fortis. It may be seen in the clay pits near *Deptford*.

The Hard Bright Yellow STONE variegated with brown is of a pretty fine close texture, with a very rugged unequal surface; and the size is from four to twelve inches in diameter. It is always oblong and flat, being no thicker in the middle than elsewhere. It has commonly a thick crust of the same substance with the stone, but softer; and is of a very bright yellow

yellow beautiful colour, with sometimes a brown coat, and at other times veined in different directions. When broken, the surface is tolerably even, and there are shining specks of spar in different places. The partitions are thin, but consist of a pale brown spar. It is moderately hard, and will take a slight polish. It is common in the tile-clay-pits about *Pancras*.

The Very Hard Brownish Yellow Undulated STONE, with a very few whitish partitions, is of a very even compact texture, with a smooth regular surface. It is from three to nine inches broad, of a flattish shape, and oftener square than oblong. When broken it has a tolerably smooth surface, with long specks of spar. The partitions are very few and small; and it is often without any. It is very heavy, extremely hard, and will bear a fine polish; but yet it will not strike fire with steel. It is common on *Mendip Hills* in *Somersetshire*.

The Hard Greyish Yellow STONE is divided into pieces by thin yellow partitions, has a very fine close texture, but the surface is irregular and unequal. It has been found from four to twelve inches broad, of a roundish flat shape, and seldom with any crust. It appears smooth when broken, with a few glittering spangles. The partitions are of a fine pale honey colour, and are very numerous, running among each other in all directions, and forming a sort of net work somewhat like a honey-comb, but of various shapes. The pieces contained in these are about an inch in diameter, having from three to six sides, and the partitions consist of a transparent spar. The whole is very heavy, considerably hard, and will bear a good polish; but it will not strike fire with steel. It is frequently met with on the sea shore.

The Round Yellow Ferruginous STONE, with thin straw-coloured partitions, has a smooth even texture; and the size is about eight or ten inches in diameter, and in the shape of a round ball. It is always crusted with a paler colour, which is softer than the substance of the Stone, and near an inch thick. The colour is a mixture of rusty iron, and a pale yellow; and when broken the surface is smooth and even, with
a few

a few shining spar specks that look like talc. The partitions are of a beautiful colour, and are composed of most bright pure spar, without any order. They are always thickest at the center, and very few reach to the surface. It is considerably heavy, pretty hard, and will bear a slight polish. They may be seen in the clay pits between *London* and *Islington*.

The Roundish STONE of a rusty red colour, with yellowish partitions, is pretty like the former, and is between six and twelve inches in diameter. It is always covered with a thick crust, of a whitish brown clayey earth, containing a good deal of spar, and is commonly about half an inch thick. When broken the surface is even, and has a few shining specks. The partitions are principally about the centre, and are of a fine bright yellow colour. It is very heavy, pretty hard, and will bear a tolerable polish. It may be seen in the clay pits near *Islington*.

The Rusty Brown STONE with whitish partitions has a pretty smooth texture, but not very firm, and the size is from two to twenty inches, and always broad and flat. It is generally covered with a thick whitish brown crust, and the surface when broken has many shining spar specks. The partitions are pretty regular, running through the stone in perpendicular directions. It is so soft it will hardly bear any polish, and it is common on the shores of *Yorkshire*.

The Hard Blackish Brown STONE with a yellow coat has an exceeding fine texture, with a pretty even surface; and it is from four to six inches in diameter, and always of an oval figure. The crust is of an ochreous clay, different from the rest of the mass; and is very brittle. It is commonly composed of thin coats laid evenly one upon another, and adhering but slightly. They are of a fine deep yellow, and are easily broken from the stone by a small blow. The body of the stone is a mixture of rusty colour and black, and when broken it has a smooth flinty surface. The partitions are of a very pale yellow, and are pretty thick, dividing the stone into irregular pieces. This Stone is very common in many parts of the kingdom.

The

The Hard Brown STONE with snow-white earthy partitions has a very close texture, with a pretty smooth and even surface. It is commonly of a roundish or oval shape, and from three to twelve inches in diameter. It is sometimes naked, but oftener met with in strata, covered with a thin brown earthy crust. The colour is of a pale brown, and when broken the surface is pretty smooth, with shining specks of spar thereon. The partitions are soft and crumbly, and consist of a white marl. It is very heavy, considerably hard, and will bear a very good polish; but will not strike fire with steel. It is not very common, though it has been found in *Somersetshire*, *Huntingdonshire*, and in a clay pit near *Tyburn road*.

The Hard Rusty Brown STONE, with yellow earthy partitions, is of a very firm compact texture, with a rough surface, and is generally flattish, and from four to ten inches broad. It has seldom any coat, but when it has, it is of a pale yellowish soft substance. The brownish rust colour is commonly spotted and clouded with black, which sometimes appears in the shape of shrubs, trees and mosses, like those of the *Mocha* Stone. When broken the surface is smooth, and there are usually no sparry specks. The partitions are narrow, few and irregular, and they consist of ochre and marl, of which the first is the largest quantity. It is considerably heavy, hard, and will take a good polish; but it will not strike fire with steel. It has been found in *Leicestershire*, *Northamptonshire*, and near *Highgate*.

The Hard Pale Brown STONE, with partitions of a clayey earth, is of a close firm texture, with a rugged surface, and commonly of a roundish or oval shape, and from four to twelve inches in diameter. It is often covered with a thin crust of a pale brown colour, though it is sometimes without it. When the substance of this Stone is broken, it appears with a coarse surface of the same colour; but if according to the partitions, it is of the colour of rusty iron. The partitions are of a clayey earth, tinged with iron particles; and they are irregular and few in number: besides these there are exceeding fine cracks, in which
places

places the Stone naturally breaks. It is very heavy, considerably large, and will bear a pretty good polish, but it will not strike fire with steel.

The Soft Pale Brown STONE, with partitions consisting of the same substance as the pyrites, is of a pretty coarse and loose texture, and somewhat porous, with a very smooth surface. Its shape is very uncertain, though most commonly roundish, or oval; and it seldom exceeds six inches in diameter. When it is broad and flat it is most commonly naked; but when roundish, it has a thick whitish crust. The surface is irregular when broken, and has a taste of vitriol, which none of the others have: the partitions are pretty numerous and irregular, but never thick; and they consist of a double plate of the vitriolic pyrites. This stone may be readily divided at these partitions, as well as the plates from each other, after it has lain some time in the air; for before that it will break more easily any where else. The substance is soft and brittle, and consequently will not bear a polish.

The Rusty Red STONE with yellowish brown partitions has a very fine compact texture, with a very smooth glossy surface. It is of various shapes, sometimes oblong or oval, but more generally pretty much flattened, and is from three to twelve inches in diameter, and from four to six thick. Its colour is of a dusky brownish red, not always perfectly mixed; for in some places they are almost distinct, and form a sort of clouds or spots. When broken it appears to have an even glossy surface, without shining specks. The partitions are many and pretty thick, with a streaked texture, composed of an arrangement of brownish yellow columnar spar, which is pretty hard, though not very bright. The pieces divided by these partitions are of different shapes and sizes, and from half an inch to four inches in diameter. This Stone is very heavy, extremely hard, and will bear an exceeding fine polish. It will strike fire with steel, but with great difficulty, and ferments briskly with aqua fortis. It is very common in *Yorkshire*, and in most of the northern counties of *England*.

The

The Brownish Yellow STONE with whitish partitions is of a very firm texture, with generally a perfectly smooth surface. It is of various shapes and sizes, and is sometimes found in continued strata, though more commonly in irregular shapes, but always compressed and flattened, from three to fourteen inches in diameter, and about five inches thick. It is met with on the sea coast, particularly near *Scarborough* in *Yorkshire*. They have seldom any crust, but when they have it is of a rusty colour, and about a third of an inch thick. The colour of the Stone is of a very fine ferruginous yellow, and when broken the surface is smooth and glossy, looking almost like flint. The partitions are numerous, and in many places thick and broad; they consist of a semi-transparent spar, which is very hard, and by these the Stone is divided into a multitude of irregular pieces, from one to four inches in diameter. It is very heavy and hard, and will strike fire with steel, but with great difficulty.

The Blueish White STONE with straw-coloured partitions has the same texture as the two former, with a rough rugged surface. It is generally found in loose marshes, of a flattish shape, with some tendency to round or oval, but generally with rough edges, and from four to eighteen inches in breadth, and from two to six thick. It has seldom or never any coat, and the colour consists of a mixture of blue and white. When broken the surface is glossy, and without any shining specks. The partitions are of a streaked texture, and are composed of a fine transparent bright spar, with irregular columns. It is considerably heavy, pretty hard, and will bear a good polish. It strikes fire with steel with great difficulty, and ferments briskly with aqua fortis. It is common in *Yorkshire*.

The Pale Yellow STONE with a rusty-coloured nucleus is of a pretty close compact texture, and of a roundish shape. It is about four inches in diameter, and is covered with a thin pale crust, within which there are from three to five coats of a different thickness, but all of the same substance, and much of the same colour, that is, of an agreeable pale yellow.

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When broken, the surface is pretty smooth, with many shining specks of spar. These coats have a nucleus or kernel in the center, consisting of a hard ferruginous stone, and are divided from it by a thin regular partition of a straw-coloured spar, from which there run a great many other strait partitions directly to the circumference, but growing narrower as they come near it. It is pretty heavy, but not very hard, for it will not strike fire with steel. The nucleus is of a different substance from the rest, and is very heavy, and of a firm texture; it strikes fire with steel, but will not ferment with aqua fortis. It consists of a large quantity of ferruginous matter with a deep brown clay. It is to be met with on *Mendip Hills* in *Somersetshire*, and in a clay-pit near *Islington*.

The Brownish STONE, with a blackish brown nucleus, is of a pretty fine close texture, with a smooth regular surface, and is always roundish, though generally a little flatted. The size is two or three inches in diameter without any crust, and there is a hard blackish brown nucleus in the center, of a close texture, contained in a thin crust of a paler colour, but of the same substance. It is about half an inch in diameter, and the crust about an eighth of an inch thick. The Stone is composed of two other coats nearly of the same thickness, and of different degrees of brown. They are divided from the nucleus by a fine thin partition of whitish spar, from which others run that are strait towards the circumference, and yet but seldom pass through the inner coat. The nucleus is hard and stony, but not so much as the former, for it breaks pretty easily, and is full of small specks of loose spar. It consists of earthy and ferruginous matter, and will strike fire with steel, though with great difficulty; and it will ferment a little with aqua fortis. It is to be met with in *Northamptonshire*, *Leicestershire* and *Yorkshire*, and has been sometimes found near *London*.

The Hard Whitish Grey STONE with a brown nucleus, is of a very fine close texture with a smooth surface, and is always roundish or oval. It is generally about two inches in diameter, and is covered with a pale whitish yellow crust. The nucleus is
brown

brown and covered with a crust as hard as itself, but somewhat of a paler colour, and on its outside there is a fine sparry partition, which is firm and hard; from this there generally runs three or four narrow partitions towards the surface, which seldom reach the outer crust. It is very hard and capable of a good polish, but it will not strike fire with steel, nor yet the nucleus. It is a very uncommon Stone, and hard to be met with.

The Small Ferruginous STONE, of a roundish or oblong shape, is generally known by the name of Mineral Bezoar, because it has coats like Animal Bezoar. It has a close firm compact texture, with a smooth surface, and is always either of a round or oblong form, generally about three quarters of an inch in diameter, and from half an inch to two inches in length. They are always covered with a crust of a pale whitish substance of about a sixth of an inch thick. They always consist of a large central nucleus, sometimes surrounded with two or three coats of ferruginous matter, and sometimes irregularly blended with it, making together a single nucleus surrounded with a crust. Both the nucleus and the crust are generally divided into three, four or five parts by pretty large cracks, which are widest on the outside, and usually become narrower as they approach the center. They are commonly empty towards the surface, but near the center they are filled up with a fine transparent spar. The Stone itself is pretty hard, and will bear a pretty good polish. It will hardly strike fire with steel, and ferments but very little with aqua fortis. It is common in the brick and tile clay-pits in all parts of *England*.

The Oblong Pale Brown STONE, with a long hollow nucleus, is of a very close firm texture, with a rugged unequal surface. The shape is oblong and cylindric, only it is largest in the middle, and becomes gradually less towards each end; but for half an inch they each terminate in a small cylinder of almost a whitish colour, and of a harder substance than the other parts. This is nothing but a lengthening of the inward substance, being only the extremity
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of the nucleus. It is between seven and eight inches long, and yet the diameter is three inches where thickest. The nucleus consists of a long cylindric tube, terminating in a blunt point at each end, which is sometimes empty, and sometimes filled with a white marl, or the matter of the stone that contains it. It is of a ferruginous colour, and is inclosed in a thin crust of a brownish substance, which is surrounded with a single, double, or triple partition of beautiful spar, and this again with two thick crusts consisting of the same substance as the rest of these stones. It is divided by three or four partitions, running like rays from the circular partition strait towards the circumference, but they generally vanish in the first or second coat. The whole is surrounded with an unequal whitish brown coat about a third of an inch thick. The cavity of the nucleus is half an inch in diameter, and the nucleus itself about an inch. This Stone is subject to a great number of cracks lying in different directions, so that when struck it will fall into many pieces, not more than the tenth of an inch in thickness each. The nucleus is very heavy and hard, but will not strike fire with steel, no more than the body of the Stone. The partitions consist of a pure white spar, which appears very bright when just broken. It has been only found hitherto in a great tile clay-pit near *Tyburn* road, about three quarters of a mile beyond *Tyburn*.

The Very Hard Smooth STONE with yellow brown and red coats, has a very fine compact texture, with a pretty smooth surface, and is remarkably heavy. Its shape is roundish or oblong, and the size is from a quarter of an inch to three or four inches in length; but most commonly of the shape and size of a pigeon's egg. It is sometimes found naked with a somewhat glossy surface, and at other times covered with a whitish crust. It consists of five or six coats, which close a firm solid hard nucleus of the same substance, that is sometimes of a deep dusky brown, and sometimes of a strong though not bright red; at other times it is composed of both these colours, either blended or in spots. The coats are alternately brownish,

yellowish and reddish, that next the nucleus being brown, the next yellow, and the third reddish, with another that is yellow, and over these one that is brown. However, they sometimes vary in the disposition. It is very common in clay and gravel-pits, and particularly about *London*, when covered with a crust. One fourth part of this Stone is iron.

The Hard Glittering Rough STONE, with brown purple and deep yellow coats, is of a coarse, uneven, and very irregular texture. The shape is always oblong, but of different lengths and thicknesses; it is from half an inch to eight inches long, and about three quarters of an inch in diameter. It has a rough surface made up of small prominences and cavities, less than the heads of the smallest pins; but this is uncommon, for it is usually stuck full of small pebbles. It is pretty hard, and breaks with a rough surface, and there is a nucleus surrounded with eight or ten coats, some of a paler, some of a deeper brown; others of a dusky and somewhat reddish colour, and others again of a deep brownish purple; but they are placed without any order or regularity. It is pretty bright and sparkling, not only when just broken, but on the surface; and the whole substance of the coats is full of small shining spangles like talc. It is common in the gravel-pits about *Oxford*, as well as in other places, and contains a small quantity of iron:

The Soft Brownish Yellow STONE is almost as soft as earth, but it is very compact, of a smooth texture, and considerably heavy. It is of a flattish oblong shape, and round at the ends. It is most commonly four inches long, two broad, and one thick. It is oily to the touch, like some of the finer boles, and breaks with an irregular but smooth surface. It contains a nucleus of the same shape as the stone, and of the same colour, surrounded with coats of the same, which are extremely thin and exceeding numerous. It has no crusty covering, nor does it at all sparkle. It ferments very briskly with aqua fortis, and burns to a beautiful pale red. It is very uncommon, but has been seen in the potters clay-pits in *Staffordshire*, and in the forest of *Dean*.

The Soft STONE, with shining brown and dusky green coats, consists of a coarse opaque substance, and is of a loose texture. It is remarkably heavy, of an oblong shape, and commonly about an inch and a half in length, somewhat in the form of a ninepin. It is harsh and rough to the touch, the surface being extremely uneven; and when broken it has an irregular and pretty rough surface. It is generally composed of four coats, surrounding a nucleus of the same substance and shape as the stone. This is surrounded by a brown broad coat, and that by another that is broader. The next is a very beautiful one, it making a fine glittering appearance, and is of a very pale brown colour; over all there is a coat of dusky brown clay, which is always rugged and unequal. It is very common in clay-pits in many parts of the kingdom, and particularly in a clay-pit near *London* behind *Black-Mary's-Hole*.

The Soft STONE, with shining whitish yellowish and red coats, is of a loose brittle texture, and moderately heavy. It is commonly oblong, rounded at the ends, and of the size of a pigeon's egg. It is very rough, and it will readily break with a small blow; it has from four to six coats of the same loose texture, but of different colours; but there is always one that sparkles, and is composed of the matter of the common selenites. The nucleus is commonly whitish, though sometimes with a mixture of yellow, and is of the same shape with the stone. The coat which immediately surrounds the nucleus is generally yellow, the next red, and the next whitish; then one that is yellow, and over these is the outermost, which is composed of great numbers of small columnar selenites, that together appear almost like crystal. It is very common in the clay-pits of *Northamptonshire*, and may be met with in several other counties.



C H A P. XXVII.

Of the harder Common STONES.

THE Hard Shining Black and White STONE is of a very irregular structure, but extremely firm, with a smooth though not glossy surface. It is from eighteen to twenty-five inches in diameter; but it is of different shapes, which all tend to be round, oval, or flat. At first sight it appears to be only of two colours, that is, a dull yellowish white, and a glossy black. The white specks are sometimes slightly tinged with a flesh colour, others are of a cream colour, and others again shine like pure crystal. The surface is of a dull dead colour, but it is very bright and sparkling when just broken. It is considerably heavy, very hard, and will take an excellent polish. It strikes fire with steel, but will not ferment with aqua fortis. It is common on the shores of the island of *Guernsey*, and is met with in many places on the *English* coast. It is used in paving the streets of *London*.

The Hard Shining Red and White STONE is of much the same texture as the former, but of a better colour, and the shape tends to roundness or an oval. It is found often of twenty or thirty inches in diameter, with a very smooth surface; and the colour is a pleasant light red, and sometimes a flesh-colour, interspersed with small parcels of a pure bright white, from one eighth to one fourth of an inch in diameter. When broken it is smooth, bright, and beautiful; and is so hard it will bear a very fine polish, as well as strike fire with steel. It is brought from the shores of *Scotland*, and is used in *London* for paving the streets. -

The Red STONE variegated with white and black is of the same texture with the two former, and has a smooth, bright, glossy surface. Some are eight inches in diameter, and the shape is generally oblong and flattish. The colours are all beautiful and bright, the
ground

ground being red, variegated with all the different degrees and forms of a white transparent and black crystalline talc, which are so various in different stones, that they do not seem to be of the same kind. It is considerably heavy and hard, will take a fine polish, and strike fire with steel. They are found on the shores of *Guernsey* island, and brought to *London* to pave the streets, where they may be easily distinguished by their surfaces after a shower of rain.

The Hard Heavy Greyish Black STONE, variegated with white, is of a more rude, irregular, and harsh texture than any of the former, though it is more compact and hard. The surface is smooth and even, but not glossy, and it is generally about ten or twelve inches in diameter; but the shape is uncertain, though it is commonly flat on one side. It is not so beautiful as the former, being of a greyish or blueish black, with opaque but very bright white, distinct from each other, yet regularly intermixed throughout the whole stone, so that it seems to consist of a regular mixture of black and white. When fresh broken the surfaces are remarkably smooth and bright, and it will bear a high polish. It strikes fire with steel, but will not ferment with aqua fortis, nor suffer any great alteration by the fire. It is found on many parts of the shores of *Yorkshire*, and is sometimes seen in the streets of *London*.

The Brownish Red STONE, variegated with white and yellowish, is of a pretty even fine texture, sometimes from three to four feet in diameter, and of a somewhat oblong and flattish shape. The ground is of a reddish brown colour, which is variegated with an impure talcky crystalline matter, generally about an inch long and half an inch in diameter, that is either of a pure or yellowish white; and these variegations are often four or five inches distant from each other. It is pretty hard, will take a good polish, and strike fire with steel, but does not ferment with aqua fortis. It is found on the surface of the earth in *Yorkshire* and other counties.

The Reddish White STONE, variegated with black and gold colour, is of a more loose texture than any

of the former, and very coarse. It is generally found between four and eight inches in diameter, and is of a very irregular shape, being seldom round, oval, or flat. The colour is either a pale flesh, a deeper red, or entirely white. The particles of which this stone is composed seem to be a crystal debased with earth, and more or less of a metalline tinge, of the size of a horse-bean. Among these, black and yellow variegations are dispersed, which are composed of crystal, earth, and talc, of different degrees of brightness. It is considerably hard, very heavy, and capable of taking a fine polish. It is common on the shores of *Yorkshire*.

The Hard White STONE variegated with brown is of a very coarse harsh texture, but extremely firm and hard, with a smooth glossy surface. The size is from two to ten inches in diameter, and it is generally of a roundish or oval shape. The ground is of a dusky white variegated with pale brown, but they are distinct from each other, and interspersed with a great many flakes, some of which consist of a pure crystalline white talc. When fresh broken it glitters very much, especially in the white parts; and it strikes fire with steel, but will not ferment with aqua fortis. It is common in *Westmoreland* and *Yorkshire*.

The Blueish White Bright Brittle STONE contains more talc and less crystal than the former, for which reason it is of a flaky texture, though very irregular, and the surface is rough and uneven. It is from ten to fourteen inches in diameter, and of a very uncertain shape, being generally rough and jagged at the ends and edges. Its colour consists of a dark blueish grey, and a pretty pure opaque white; the former of which is the ground, though sometimes it happens otherwise. It is composed of different masses, as in the other kinds; and those that are stony or crystalline are much of a size, and seldom larger than a horse-bean. It is but light in comparison of the rest, and is very brittle. It does not at all seem proper for polishing, though its stony parts will strike fire with steel; but it will not ferment with aqua fortis, and when burnt it is whitish with a silvery gloss. It is common
in

in *Yorkshire* and the neighbouring counties, where the common people make use of it in the winter nights to keep the bed warm, or rather their feet, to which it is laid after it has been heated; for it will retain the heat a considerable time; and they give it the name of the Warming-Stone.

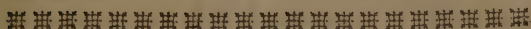
The Brown Brittle STONE variegated with yellow is very beautiful, with a pretty fine even texture, but more loose than the former, and with a rough surface occasioned by prominences and cavities. It is of various sizes, but seldom exceeds six inches in diameter; and the shape is quite irregular, though it is sometimes flat, and tending to an oval. The distinct parts of which it consists are seldom above one twelfth of an inch in length; and they are all of the same colour in the same mass, which is of a pale brown; and among these are a great number of talcky flakes that are extremely bright, which are sometimes intermixed with spangles of black and whitish talc; but they are so uncommon, that brown and yellow may be said to be the true colours of the stone. When broken it appears extremely beautiful; but it is so soft as not to be capable of a good polish, and therefore it is no wonder it strikes fire with steel with difficulty. It is found in many parts of *Sussex* and *Yorkshire*, and has been seen on *Hampstead Heath*.

The Hard Purplish Brown STONE, variegated with white and yellow, has a very rough, coarse, uneven texture; but it is firm and hard, with a rough unequal surface. It is commonly found from ten to eighteen inches in diameter, and the shape always approaches to round or oval, with a smoothness and flatness on one side. The colours are generally brown and white, or brown and yellow. The brownish purple parts make the ground, and consist of considerably large pieces, that are perfectly opaque. Those that are white and yellow are smaller, more bright, and in some degree transparent, they being composed of a mixture of crystal and talc. It is a little bright when fresh broken, and is very hard, for it will readily strike fire with steel. It is common on the shore near *Scar-*

borough, and has been sometimes seen in the streets of *London*.

The Heavy Red STONE variegated with black and white, named *Call* by the Miners, is of a pretty fine even texture, extremely hard and firm, and generally of a smooth surface. It is from five to twenty inches in diameter, and the shape has a tendency to round or oval, with a flat side. The *moleculæ* are of different figures, and seem to contain no pure talc. They are of a fine deep red, variegated with black and white irregularly interspersed among them, and lodged in all directions. The white are bright and glossy, but the black are more glittering; and when fresh broken the black and white appear very bright. It is remarkably heavy, very hard, and will readily strike fire with steel. It is found about the mines of *Sussex* and *Gloucestershire*.

The Hard Blueish Green STONE, variegated with white, is the most beautiful of the whole class. It is of a pretty firm, fine, but unequal texture; and in many places it is loose, irregular, and porous. The surface is very smooth; the usual size is from three to four inches; and it is of a round or oval shape, but always flattened on one side. The greenish particles, of which the Stone chiefly consists, are all of a crystalline substance debased with earth, and tinged with metalline particles. Its variegations are small masses of white, consisting of crystal and talc, and debased with very little earth. It is very beautiful when broken, and is extremely heavy and hard; but it will not admit of a perfect polish, because its texture is a little porous: however, it readily strikes fire with steel. It is found on the shores of *Sussex*, but is most common in *Wales*; and contains a pretty deal of copper.



C H A P. XXVIII.

Of STONES *approaching to the Nature of FLINT.*

THE Yellowish White STONE filled with pebbles, commonly called the PUDDING-STONE, is of various shapes, according to the various pebbles it contains. It has been by some ranked among pebbles, but improperly; for they are no part of the Stone itself, which is a distinct species, and different from all others. The sementitious substance is an opaque Stone, of a very fine, close, and firm texture, with a pretty smooth surface on the inside, though in the masses it is frequently very rugged and unequal. In size it is from that of a walnut to three or four feet in diameter, with some tendency to roundness. It is of a pale yellowish colour, and when broken the surface is smooth, even, and flinty. It is pretty heavy and very hard, and consequently will take a very beautiful polish. It will readily strike fire with steel, but does not ferment with aqua fortis. The pebbles contained in it are of various kinds and sizes, from that of a pin's head to the bigness of a walnut. It is found in many parts of *England*, particularly in *Hertfordshire*, and is used for the tops of snuff-boxes and other toys.

The Greyish White STONE filled with pebbles is finer and harder than the former, but it is very opaque, and has an exceeding smooth glossy surface, for it resembles a smooth spotted pebble. It seldom exceeds ten inches in diameter, and its shape is almost always roundish all over. The pale greyish white colour often contains more of blue than pure white, and the surface is very smooth when broken. When cut into thin pieces it is somewhat transparent, and it is capable of a beautiful polish. It readily strikes fire with steel, but will not ferment with aqua fortis. It is almost always found in gravel-pits among flints and pebbles, and is used for snuff-boxes like the former.

The Red-STONE filled with pebbles is of the same nature with the two former, and is very opaque, with a pretty coarse texture and a rugged surface. It is found from six inches to four feet in diameter, and of very irregular shapes. The colour is a deep red, and sometimes there are different shades in different parts of the same piece. When broken it is scarce at all bright or glossy; and its fineness is generally in proportion to its colour, for it is greatest where that is least. It will readily strike fire with steel, but will not ferment with aqua fortis. The pebbles it contains are of various sizes and kinds, and not so perfectly joined to the mass as in the other species; they are, however, not easily separated from it, and therefore it is as fit for use as any of the former. It is common in *Lincolnshire*, *Derbyshire*, and *Yorkshire*, but is seldom brought up to *London*.

The Brownish STONE filled with pebbles is of the same kind as the former, but is more impure and coarse. It is perfectly dull and opaque, with a rough harsh texture, but yet pretty firm; and the surface is rough, rugged, and unequal. It is from two to five feet in diameter, and is of a very irregular shape, though it sometimes shews a tendency to roundness. The colour is always of a dusky brown, but in various degrees. It is not so heavy as the former, though it strikes fire with steel. It contains very small, as well as some large pebbles, which are generally a little flattish. It is common in *Leicestershire*.

The Flesh-coloured STONE, filled with reddish impure crystalline nodules, is of a coarse, harsh, loose texture, and somewhat porous, with a rough irregular surface. It is found from four to twelve inches in diameter, and the shape is almost always flattish. It is generally so full of the masses it contains, that it is hard to find a speck of the pure cement of the bigness of a pea. Its colour is a very pale whitish red, and the surface when broken is uneven without any gloss. It strikes fire with steel, though not without some difficulty, but does not ferment with aqua fortis. The nodules are all of the same kind, but of various sizes, from the bigness of a pin's head to an inch in diameter.

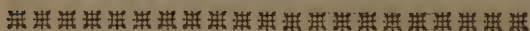
diameter. There is a great number of them, and they lie in different directions. Those that are large are easily struck out of the cement, leaving a pretty smooth cavity behind. These nodules consist of a sort of crystalline particles. This Stone is common in the sides of hills in *Yorkshire*.

The Blueish Glittering STONE, filled with white impure crystalline nodules, is of a pretty coarse, harsh, uneven, and irregular texture, with a rough surface; and is of various sizes, from one foot to four or five in diameter, and generally of a flattish shape. The colour is a deep dusky blue or lead colour, and there are many bright glittering spangles. The surface is roughish when broken, and it seems to be a-kin to some of the lime-stones. It is very heavy, moderately hard, and capable of a very good polish. It readily strikes fire with steel, and ferments a little with aqua fortis. The crystalline masses are the same as those in the former Stones, only they are without any colour. It is found in many parts of *Leicestershire*, as well as on the shore near *Scarborough*; but it is never put to any use.

The Whitish Green Beautiful STONE, filled with crystalline nodules, has a pretty fine, close, firm and hard texture, with a rugged unequal surface, without the least gloss or brightness; and the crystalline nodules generally stand pretty far out of their cement. Its size is from two inches to two feet in diameter, and its shape is generally flattish, seldom inclining either to round or oval. The colour is a pale whitish grey, irregularly tinged with a very beautiful green; though it is not diffused through the whole Stone, but appears in the form of specks and clouds. It has a rough and wrinkled surface when broken, without the least transparency; and in breaking of it the nodules get out of their places, leaving cavities behind. They are generally smooth, but not glossy; and they seldom exceed the size of small pease. They are outwardly of a very deep green, but within are white and opaque. They consist of a tabulated spar, and the green colour is owing to the mass in which they are included. This Stone is moderately heavy and
pretty

pretty hard, but it will not take a good polish, nor yet strike fire with steel without difficulty. It is found on the shores of *Minorca*, and now and then on the *English* coast.

The Brittle Pale Red STONE variegated with white veins, and containing red nodules, is the softest and most brittle of this class, with a coarse loose texture, and a rough irregular surface. It is of various sizes, for it has been found from one to thirty inches, and is always flattish. The red colour is different in different masses, it being sometimes of a brick colour, while other parts are of a pale flesh. When broken, it is in many places perfectly spongy, without the least brightness, except in the white veins, which are not many. The red nodules are from the size of a pin's head to that of a hazle nut, and consists of the same substance as the Stone itself. This Stone is not proof against water, and it will scarce give fire with steel. It is common in the shores about *Scarborough*.



C H A P. XXIX.

Of STONES *that outwardly appear like* PEBBLES.

THE Stone called PEBBLE CRYSTAL has a very smooth equal texture, it being in reality nothing else but Crystal in this form. It is free from all mixtures, and is found from the size of a pin's head to twelve inches in diameter. It is generally pretty round, though sometimes it is not without irregularities on the surface, and it is sometimes flattish. It has a close firm texture, is pretty heavy, and as transparent as water. It is very hard, and is capable of a very high polish; and when broken it is very bright and glittering. It strikes fire with steel, but does not ferment with aqua fortis. They are found in almost all parts of the world, but are most common in *America*, where they are very large, and are generally known here by the name of *Brazil* Pebbles. They are found in that country on the banks of rivers, as well as in
Germany,

Germany, Italy and France. They are also met with in *England*; but their size is very small. Spectacles are made with this stone.

The Purple Half-transparent Crystalline STONE has a rough uneven texture, but is very firm, with a smooth surface; it is generally between an inch and four inches in diameter, and of a roundish shape, a little flattened. It is of an unpleasant yellowish white on the outside, but is pretty heavy, and when broken the colour is a reddish purple, very bright and glittering. The colour is not uniform, but appears sometimes in blotches, and sometimes in veins, in such large quantities, that they seem to tinge the whole mass. It is not quite so hard as the former, but will strike fire with steel. This is found in rivers and gravel-pits, and has been brought from *Germany* and *Bohemia*. It is said also to have been met with in gravel-pits near *London*.

The Snow-white Opaque Crystalline STONE is of a very smooth, firm, and close texture, with a smooth even surface: its size is generally between a quarter of an inch and two inches, and though it is sometimes round, it is more frequently oval and flattish. It is as white as chalk on the outside, is pretty heavy, and when broken the colour is bright and shining, and as white as snow. It consists of a homogeneous substance, and is extremely hard. It freely strikes fire with steel, but will not ferment with aqua fortis. It will take a very fine polish, and is common in the gravel-pits of *Norfolk*.

The Opaque Whitish Reddish or Yellowish Crystalline STONE, commonly known by the name of the red white and yellow sparry Pebble, is the most common Stone we have. It consists of a rough irregular and opaque substance, which is pretty firm and compact in its texture, with a pretty smooth surface, though often full of cracks which sometimes penetrate deep into the body of the Stone. It is met with from the size of a pea to six or seven inches in diameter, and is inclinable to a roundish shape, though it is sometimes flattish, especially on one side. The colour is much the same without and within, and it is
irregularly

irregularly tinged with different colours. These are sometimes uniform throughout the whole substance of the Stone, but sometimes appear in spots, blotches, and irregular veins. It has a little brightness when broken, and appears to be of a loose texture. It has been thought to consist of spar, but this is a mistake. They are to be met with in gravel-pits and other places all over the kingdom.

The Yellowish White Spungy STONE has somewhat of the nature of sand-stones hewn out of quarries, insomuch that it might be mistaken for a fragment of that kind. The texture is coarse, but pretty firm, though there are small cavities that give it some resemblance of a sponge; the surface also has the same appearance, and it is generally from half an inch to two inches in diameter. It is pretty heavy, and more or less of a yellowish white, without the least brightness. It is composed of an irregular crystalline matter, debased with a mixture of whitish and yellowish opaque substance. Tho' it is pretty hard, it will not easily strike fire with steel, nor does it ferment with aqua fortis. When examined with a microscope it appears to be a petrified sponge, for there are more cavities than solid matter. It is common in all parts of the kingdom, especially in gravel-pits.

The Hard Porous Whitish Crystalline STONE has a rough cavernous and spungy surface; but it has not so many pores on the inside as the former kind. There are veins on the outside, dispersed in an irregular manner, of different breadths, and often interwoven with each other; likewise they all stand up in ridges above the surface of the Stone. Sometimes the pores on the inside are wanting, which renders the texture the more firm; and it is from one inch to six in diameter, and generally of a flattish shape, though somewhat roundish. It is naturally white, and sometimes there is a mixture of faint red, or pale yellow. It is pretty heavy, very hard, and is glossy when broken, especially in its veins, which are more close and compact than the rest of the mass. It strikes fire with steel, but will not ferment with aqua fortis. It is common in all gravel-pits.

The

The Greyish White Opaque STONE is of a very close texture, with a smooth even surface; but it is subject to cracks of various sizes, and is from an inch to a foot in diameter, sometimes roundish, and sometimes flat; but in this last case it is always subject to superficial cracks. It is perfectly opaque and dull when broken, though it consists of a uniform crystalline substance, debased by a mixture of white and grey clay. It is very heavy, and pretty hard, and will readily strike fire with steel. It is common in gravel-pits.

The Brittle White Sandy STONE is of a very loose brittle texture, with a pretty smooth regular surface, though it is somewhat rough to the touch; the shape is irregular, though generally flattish, and the size is from one to twelve inches in diameter. It is pretty heavy, and when broken appears of a bright glittering white. It consists of a great deal of pure white sand, to which it may be reduced, and it breaks with the slightest blow into a great number of pieces. It is readily penetrated by water, which will pass through it unchanged. It will not ferment with aqua fortis. It is not very common, but has been found in the gravel-pits of *Northamptonshire*.

The White Crystalline STONE with yellow specks, is by some called the Worm-seed Stone. It is of a pretty hard compact texture, and generally has a smooth surface, though sometimes there are irregular cavities. It is of a roundish or oblong shape; and thicker at the middle than at the edges. It is commonly about three or four inches in diameter, and the colour is generally white, though it has sometimes a pale brown cast. The specks are about the breadth of a small pin's head, and are of a very bright pale yellow, by which characteristic it is easily distinguished from all other Stones. The colour is dull on the outside, but bright and glittering when broken; and it consists of a large angular grit, extremely well united. It strikes fire with steel, but does not ferment with aqua fortis. It is common in *Yorkshire*, and is sometimes found in the gravel-pits near *London*.

Whitish

Whitish Brown Dull STONE is softer than any of the former, and yet the texture is pretty even and regular. It is generally above a foot in diameter, and its shape is always broad and flat, with deep longitudinal cracks on the surface, which are crossed with some that are smaller. It is of a very pale brown, and has sometimes a faint yellowish or reddish tinge. The surface is dull and opaque, and when broken is generally full of cracks, the largest of which are often filled up with crystals, which look very bright and glittering. It is pretty heavy, and is harder in some places than others. It is found in many parts of *England*, and particularly on *Hampstead Heath*, very deep in the ground. It sometimes contains large pieces of petrified wood, which are so stony they cannot be perceived, except by the knots and the like.

The Blueish White Hard Crystalline STONE is not of a very fine structure, but it is firm and close, with a smooth surface. It is generally from three to ten inches in diameter, and of a flattish shape, somewhat approaching to roundness. It is of a dull light lead colour on the outside, but when broken is bright and glossy, and the thin pieces are a little transparent. It is very heavy, will take a fine polish, and readily strikes fire with steel. It is very common on the shores of *Italy*, *France* and *England*.

The Brownish White Hard Shining STONE is pretty coarse, but very firm, and has a rough irregular surface. It is about six or seven inches in diameter, though sometimes much smaller, and at other times extremely large. It is of a dusky white on the outside, with a small mixture of pale brown; but when broken it is bright and glittering, with an unequal surface. It consists of a grit with blunt angles, together with roundish bright particles, cemented together with a substance nearly as bright. It is sometimes full of black and green specks, of the size of very small grains of sand. It is pretty heavy, and capable of a good polish; but it will not strike fire with steel. It ferments violently with aqua fortis, which discovers its nature, and that it consists pretty much of spar. It is found in *Derbyshire*.

C H A P. XXX.

Of Flinty S T O N E S.

THE Common FLINT is a stone universally known, and of a very fine compact texture, with a surface that is generally rough and rugged, with various protuberances. The size is different, from an inch to two or three feet in diameter. The shape is extremely irregular, it being in gravel-pits of the shape of a common pebble; but in chalk, where it is found in greatest plenty, it is met with in all shapes. It is always covered with a white crust, which is sometimes very thin, and sometimes one sixth of an inch thick. It consists of crystal, debased with a large mixture of white earth, of the clay kind. The substance of this stone is uniform and equal, and is generally blackish, though sometimes grey. When broken it is of a fine even glossy surface, is semi-transparent, and will bear a fine polish. It is met with in all countries, and is put to various uses.

The White Flinty STONE is pretty fine, with a smooth compact texture, and a smooth surface, only it is furrowed with shallow wrinkles. It is generally roundish, but sometimes oblong, and its size is from half an inch to eighteen inches in diameter. The colour is uniform throughout, which is always white, with a small blueish cast. It is not equally pure, nor of the same degree of transparency; for some resemble the white cornelian, and others the common ground of agate. The coat is sometimes a little reddish, but it is more commonly grey, or of a greyish brown. When broken it appears to have a fine even flinty surface; and as it is very hard, it will bear a good polish. It will readily strike fire with steel, but will not ferment with aqua fortis. This is a common Stone in many parts of *England*.

The Red Flinty STONE is of a very fine firm texture, with a surface not so even as the former; for
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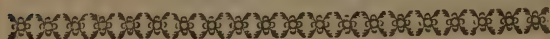
it has deeper wrinkles, and often many prominences and cavities in different parts. It is generally roundish, and from an inch to three inches in diameter. It is naturally uniform, being without spots, clouds, or streaks, and its colour is very fine, but it is of different degrees of red in different Stones, as well as of different purity. It has sometimes small whitish opaque spots, and some are brighter and more transparent than others. It often nearly resembles the different cornelians, and it has generally a whitish coat, with a small mixture of ash-colour, or yellowish brown. When broken, it appears to have a flinty surface, is very hard, and capable of a good polish. It strikes fire readily with steel, but will not ferment with aqua fortis. It is very common in our gravel-pits, and many of the seals sold for cornelian are made therewith.

The Yellow Flinty STONE is of a very fine even texture, and is extremely firm; but the surface is rough and irregular, it being full of wrinkles and other inequalities, and the shape is generally rugged and unequal. The size is from an inch to seven in diameter, and the substance is homogeneous, without any variation. It consists of crystal, debased with a yellow earth, to which it owes its colour. They are sometimes of a deep yellow, and sometimes inclining to a whitish grey. It resembles the yellow cornelian, and is often equal to the finest Stones of that kind; but it is sometimes subject to imperceptible flaws, which will make it fly to pieces when broken. However, the surfaces are fine and glossy, and it is more transparent than the former: as it is very hard, it will take a fine polish. It readily strikes fire with steel, but will not ferment with aqua fortis. It is not very common, but has been found on *Hampstead Heath*.

The Blueish Flinty STONE is of a pretty smooth and close texture, with a rough irregular wrinkled surface, and a very uncertain shape. It is generally about two inches in diameter, and is not of so simple a colour as the former, for it is of different degrees of blue in the different parts, some of which are deep, and others approaching to white, appearing in clouds,
spots,

spots, and short lines. It is without cavities or cracks, and its outer coat is of various colours, but generally with a white and chalk-like appearance; sometimes it is of a blueish brown, and sometimes very thick and yellow. It is pretty hard, will take a good polish, and freely strikes fire with steel. It is very common in gravel-pits.

The Greenish Flinty STONE is not so close and compact as former, nor yet so fine, though the surface is pretty smooth and even. It is generally of a roundish or oblong shape, and from half an inch to two inches in diameter. It is always of the same colour, without either spot or cloud, which is of a deep dusky and somewhat blueish green. It is sometimes of the colour of green jasper, but has a coarse look, as it contains a great deal of earth. The coat is generally thick and white, and sometimes of a blueish dusky grey. When broken the surface is even, and as it is very hard, it will bear a good polish. It readily strikes fire with steel, but will not ferment with aqua fortis. It is not very common, and consequently but seldom found.



C H A P. XXXI.

Of Common PEBBLE-STONES.

THE Yellowish Grey PEBBLE with a blueish white crust is of a fine close texture, and the surface, though regular, is a little wrinkled. The shape is roundish or oblong, and the size from one to five inches in diameter. It has commonly a large nucleus in the centre, inclosed in a broad coat, which is covered with a very thin crust. The nucleus is of a greyish yellow, sometimes perfectly blended together, and sometimes irregularly mixed in the form of clouds or large spots. There are often white opaque spots dispersed here and there, and the nucleus approaches to pure flint. The coat next to it is of a blueish white, and of a somewhat coarser texture. The external

ternal crust is of a whiter colour, and is of the same substance, only there is a greater mixture of earth. When broken it has a smooth glossy surface, and the nucleus is pretty transparent. It is very hard, will bear a good polish, and strikes fire with steel. It is found in the gravel-pits in *Northamptonshire*, and sometimes in those near *London*; however, when found it is of no value.

The Whitish Grey and Reddish Coated PEBBLE, with a yellow centre, is more beautiful than the former, and has a fine close texture, with a pretty even surface, though full of wrinkles. It is of a flattish round shape, and the common size is about three inches in diameter. It is composed of a large nucleus, which is the principal part of the stone, and is of a deep bright yellow, and pretty transparent. It is sometimes marked with roundish whitish spots, from the bigness of a pin's head to that of a pea, and is surrounded with a coat of a pale greyish white, of a flinty substance, which sometimes receives the matter of the nucleus into itself in the form of clouds, making a broad undulated line. This is generally covered with a red coat, and that with the external crust, which consists of a great quantity of earth. When broken it has a glossy surface, and is hard enough to take a polish. It is very common on *Hampstead Heath*, and in many other places.

The White Black Brown and Straw-coloured PEBBLE, with a yellow nucleus, is a very beautiful stone, and of a fine texture. It is generally of a roundish or oval shape, and seldom exceeds three inches in diameter. The nucleus is large, and is the principal part of the stone. It is surrounded with several coats, which resemble the zones of the onyx. The nucleus is very bright, and pretty transparent, and of a deep but not bright yellow. It is sometimes of the same colour throughout, and has clouds of a different yellow and flint colour, also opaque specks of a palish white, and sometimes likewise the centre is transparent crystal. The nucleus is usually surrounded with a narrow black circular line, and is covered with a coat of a paler yellow than the nucleus, and that by another

another of an opaque white; the next is of a pale brown, besides which there are four or five others of the same colours placed alternately. These are all covered with a blueish crust, but sometimes with a whitish, and always greatly wrinkled. When broken, the surface is glossy and pretty transparent, and is very hard and will bear a good polish. It strikes fire with steel, but will not ferment with aqua fortis. It is common on *Hampstead Heath*.

The Whitish Blueish and Brown PEBBLE, with a dull brown nucleus, has a close and firm texture, with an even surface, only it is wrinkled. It is generally of a roundish or oval shape somewhat flattened, and the size is from one to five inches in diameter. The nucleus is pretty large, of a deepish brown and of a pretty fine texture, but not very transparent or bright. It is commonly surrounded with a broad whitish coat, then with a narrower of the same colour as the nucleus; after that is a third of the same substance with the inner coat, and these are covered by one of a blueish colour, of a more flinty texture than the other part of the Stone, over which there is a crust like the rest, but more earthy. This account of the Stone will hold good in general, but it is subject to great varieties, as indeed are many others. When broken the surface is very bright and glossy, and as it is pretty hard, it will bear a good polish. It is common on *Hampstead Heath*, and in the gravel-pits about *London*.

The PEBBLE with white and brown coats, and a shining brown nucleus, is a very pure and beautiful Stone, and has a fine close texture, with the common wrinkled surface of other Pebbles. It is generally of a round or oval form a little flattened, and commonly four or five inches in diameter. The nucleus is very large and oblong, and of a deep bright pleasant brown. It is transparent, though sometimes subject to whitish specks. It is surrounded with a coat of a milky white, sometimes mixed with a little pearly blue; and next to that is one of the same colour with the nucleus, only it is not so transparent nor bright. Over this is the crust that covers the whole, and in general it is
not

not inferior to an agate. When broken, it has a bright glossy surface, and where thin is pretty transparent; it is extremely hard, capable of a fine polish, and will strike fire with steel. It is found in gravel-pits, but is not so common as the former.

The PEBBLE with white brown and yellow coats, with a small brownish yellow nucleus, has a fine close texture, with the wrinkled surface of other Pebbles. It is commonly roundish or oval, and the common size is about an inch in diameter. The nucleus is about as big as a small nutmeg, and is surrounded by a coat of a dull opaque impure white, and that with one of a pale whitish brown; the next is of a pale red or flesh-colour, and the fourth of a blackish brown. The outer crust is a pale yellow, and as thick as any of the rest. The nucleus is pretty bright, but has little or no transparency; however, this Stone, as well as others, is subject to some varieties. It is very hard, will bear a fine polish, and readily strikes fire with steel. It is pretty common in the gravel-pits about *London*, and might be put to good uses by the lapidaries.

The PEBBLE with greyish white, pale brown, and reddish coats, with a small brown nucleus, is of a very fine close texture, and has the wrinkled surface common to other Pebbles. The shape is roundish or oval, and is commonly four or five inches in diameter. The nucleus is usually of the size of a nutmeg, and of a deep brown colour. This is covered with a coat of a pale whitish grey colour, and that by another that is of the like but thinner, and next to these there are generally four or five of the same colour as the nucleus, and others of a very pale whitish brown alternately disposed. There are also five or six others alternately disposed of the same brown with the nucleus, and of a very pale brown. These are surrounded by the crust, which is generally whitish; the nucleus is frequently spotted with small black points. It is more transparent than most other Pebbles, and when broken has a flinty surface; it is very hard, will bear a good polish, and strikes fire with steel. It is common in the gravel-pits on *Hampstead Heath*.

The

The PEBBLE with yellow, red, and blueish white coats, with a reddish brown nucleus, is of an exceeding fine firm texture, and is not so wrinkled on the surface as most of the other kinds. It is of a roundish flattish shape, and commonly about three inches in diameter; the nucleus is pretty large, of a very fine texture, and pretty bright and transparent. It is of a pale red, and is inclosed in a coat of a fine pearl-colour or blueish white, which is pure, bright and transparent; next to this is a fine red coat, and after that several pearl-coloured and red coats alternately placed; over these there are three or four coats of a pale yellow, and the outer crust is of a pale blueish colour. It is more transparent than most other Pebbles, and when broken has an even surface; it is very hard, will bear the highest polish, and readily strikes fire with steel. It is common in the gravel-pits about *Kensington* and many other places. It is in some use with our lapidaries.

The PEBBLE with white orange brown and dusky yellow coats, and a brown nucleus, is of a very fine close texture, with a wrinkled surface as the rest of the Pebbles. It is of roundish or oval shape, and from one to three inches in diameter. The nucleus is small, and the coat that immediately surrounds it is of a clear white. The next to that is orange, and then there are eight or ten of different colours, composed of brown or yellow, after which are others of a dusky white, with a fine orange-colour between them. The whole is very pure, bright and transparent, though it is subject to many variations. When broken it has a fine glossy surface, is extremely hard, and consequently will bear a very fine polish. It is common in the gravel-pits on *Hampstead Heath*, and in many other places about *London*.

The PEBBLE with whitish brownish and yellowish coats, and a brown nucleus, is of a more coarse texture than any of the former, though it is pretty firm and hard. The surface is more smooth than that of other Pebbles, and it is generally pretty round, and between two and three inches in diameter. The nucleus seldom exceeds the size of a horse-bean, and is sur-
rounded

rounded by an irregular undulated coat, composed of others that are narrow ; next to this are three or four others, which are composed partly of a very deep brown, with some that are yellowish, and others of a dusky pale blue. They have all a mean appearance, and are perfectly opaque. It is very scarce, and is of no value.

The PEBBLE with yellowish brown and ash-coloured coats, and a blueish white large nucleus, is a very beautiful stone, and has a fine firm texture with a wrinkled surface. It is generally roundish, and from one to four inches in diameter. The nucleus is large and very beautiful, and sometimes makes the principal part of the stone. It is of an exceeding fine texture, and very bright and transparent, approaching to a white cornelian. It is of the colour of pearl with a blueish white, but is often debased with clouds, spots, and veins of an opaque white. This is surrounded with a yellowish brown coat that is clear and transparent, and then there is another of a pale ash-coloured grey as fine as the former : these are surrounded with the outer crust, which is of a blueish or ash colour ; however, the coats and the stones are met with in different proportions. It is more transparent than any of the rest, is very hard, will take a fine polish, and strike fire with steel. It is common in the gravel-pits on *Hampstead Heath*, and about *Windser*.

The PEBBLE with flesh-coloured, brown, and blueish white coats, and a fine large white nucleus, has a fine, close and firm texture, and the surface has only some slight wrinkles ; the shape is roundish or oval, and generally about two or three inches in diameter. The nucleus is oblong, and not so blue as that of the former, but is as fine, bright and transparent. It is encompassed with a great number of coats of a pale brown, blueish white, and a pale white light red placed alternately, and covered with a whitish crust. They seem all to be of an equal degree of brightness and transparency ; but it is subject to great variations. It is hard enough to strike fire with steel, and will bear a very fine polish. It is common

common in the gravel-pits of *Hertfordshire*, and is used in *London* to make tops for snuff-boxes.

The PEBBLE with red flesh-coloured and yellow coats, and a white nucleus, is a fine beautiful Stone, and of a very fine close texture, with a wrinkled surface like that of other Pebbles. It is generally roundish though sometimes oblong, and is commonly about three inches in diameter. The nucleus is commonly pretty large and opaque, though of a very fine texture, and is frequently full of coarse roundish white spots. This is commonly encompassed by a thin bright red coat, and that by one of a beautiful bright yellow, next to which there is another of a flesh-colour, and then four, five or six others of the same colours, but not placed in an alternate order. They are all very bright, and more transparent than the nucleus. Sometimes the nucleus with the coats all blend into one mass; but they are more frequently, instead of being formed into coats, disposed in irregular lines and veins. When broken, the surface is fine and smooth, and as it is very hard, will take an elegant polish, as well as strike fire with steel. It is common in the gravel-pits on *Hampstead Heath*.

The PEBBLE with very thin numerous brown and yellow coats, and a greyish white nucleus, is of an exceeding fine close texture, with a surface not so much wrinkled as in other Pebbles. It is generally of a roundish shape, and from one to four inches in diameter. The nucleus is large and of a fine texture, but not quite so transparent as the rest of the Stone. The grey and the white are sometimes distinct, and at others blended together, but is subject to small grey opaque spots. The coats are many in number, but only of two colours, that is, a pale brownish yellow and a dusky brown placed alternately. They are very bright and beautiful and very transparent, and are covered with white opaque dull crusts. It has a glossy surface when broken, is very hard, will bear a fine polish, and will strike fire with steel. It is common among gravel in *Hertfordshire*.

The PEBBLE with brown, yellow and white coats, and a greyish white nucleus, is of a fine close texture,

with a rugged wrinkled surface; is generally oblong and flattish, and from one inch to five in diameter. The nucleus is sometimes no bigger than a horse-bean, though the Pebble be large; and yet it is sometimes an inch broad in smaller. The surface is glossy, but it is very opaque, encompassed by many fine regular coats of a fine deep brown, a very pale yellow with a little mixture of brown, and a very fine white. The brown is next to the nucleus, and the other colours are placed alternately, but tinged more than one at a time. The white often looks a little dirty, from being tinged with the coats on each side. That under the crust, which is generally of a blueish grey, is brown; however, the whole is subject to great varieties. Its surface is glossy when broken, and, as it is very hard, will bear a good polish, and strike fire with steel. It is common on *Hampstead Heath*, and in the gravel-pits about *Islington*.

The PEBBLE with white grey and flesh-coloured coats, and a very white nucleus, is of an even close texture, with a very rough wrinkled surface, and a flat roundish shape, from two to three inches in diameter. The nucleus is of various sizes, from the bigness of a pea to that of a walnut; and is of a fine texture, but opaque and dull, as are all the other colours. It is irregularly surrounded with many coats of different thicknesses and different colours. Sometimes the grey, the white, the yellow, and the flesh-colour appear distinct in the same stone; but this is seldom, for they are most commonly blended together. When broken it has a smooth but not a glossy surface, and is so hard as to be capable of a good polish, and strikes fire with steel. It is common in the gravel-pits about *London*.

The PEBBLE with brown ferruginous and yellow coats, and a brownish white nucleus, is one of the coarsest of this kind; but the texture is hard and compact, and the surface is not so wrinkled as many others: however, there are several prominences and cavities, which render the shape irregular, though it is generally somewhat oblong. It is from one to four inches in diameter; and the nucleus is sometimes so pale,
that

that it is almost white. It is encompassed with four or five coats, whose colours are very good: that next the nucleus is of a rusty-coloured brown, the next to that pale brown; after which is another of a rusty brown, then one of a deep yellow; the next is brown, and then comes the crust, which is of a pale whitish grey. It appears rough when broken, and it is so hard as to strike fire with steel. It is not very common, though it has been met with in different places.

The PEBBLE with brown and grey coats, and a blueish nucleus, is of a very fine firm texture, with a smooth surface, and not so much wrinkled as many others. The shape is oblong, and from one to three inches in diameter. The nucleus is of a pure flinty substance, sometimes of the same uniform colour, but more frequently veined or spotted with a lighter or darker colour of the same kind. This is encompassed with a fine deep brown coat, which is very bright; and that is succeeded by one of an ash-colour, as bright as the nucleus. The crust is next to these, which is pretty thick. This stone is subject to variations, for it has sometimes to the number of six coats, and sometimes there are two blended into one. It has somewhat more of a transparency than most of this kind; and as it is extremely hard, it is capable of a good polish. It is met with in some parts of *Hertfordshire*.

The PEBBLE with thick whitish and red coats, and a grey nucleus, is of a very fine texture, but the surface is rough, irregular, and deeply wrinkled. Its shape generally tends to roundish, and it is most commonly an inch and a half in diameter. The nucleus is hard, bright, glossy, and transparent; the next coat is usually red, with a little mixture of rusty brown, and is not so transparent as the other parts of the stone; next to this is a coat of a blueish white or pearl colour, very bright; after this comes the crust, which is thick, coarse, of a very bright white, and of a loose stony substance. This is the common appearance of the stone, and sometimes the coats are more numerous. It is very hard, the substance being flinty, and is capable of the highest polish. It is not common;

but it has been found in *Northamptonshire*, and near *Paddington*.

The PEBBLE with white flesh-colour and bright red coats, and a blueish white nucleus, is of a fine close even texture, with a very rugged wrinkled surface, and a roundish shape. It is not above two inches in diameter, and the nucleus is surrounded with many white, flesh-coloured, and red crusts, beautifully disposed, but not always alternately; though that next it is generally red, and they all together have a very fine effect. This stone is generally very bright and transparent, and when broken it has a smooth glossy surface, is very hard, and will bear a fine polish. It is very common on *Hampstead Heath*.

The PEBBLE with brown yellow and flesh-coloured coats, and a greyish blue nucleus, is of exceeding fine smooth texture, with a surface a little wrinkled, and is of a roundish or oblong shape, but a little flattened, and seldom more than three inches in diameter. The nucleus is very beautiful, bright and transparent. It is encompassed with many coats of a pale brown, and a fine red, which sometimes is of a flesh-colour, and also of a somewhat dark yellow, they are not always disposed in the same order; but the flesh-coloured coat is generally next, the nucleus and the yellow coats are fewest in number; but it is often debased with small coarse spots, and perhaps more than any other. When broken, it is of a fine glossy surface, is extremely hard, and capable of a very fine polish.

The PEBBLE with white yellow flesh-coloured and red coats, and a greenish blue nucleus, is undoubtedly the most beautiful of the *English* Pebbles, for it comes up to the *German* Agates. The texture is exceeding fine, smooth, and hard, with a surface less wrinkled than most other kinds. The shape is roundish or oblong, and from three to four inches in diameter. The nucleus is pretty large, and sometimes round, but more commonly oval. It is of a very fine texture, with a glossy surface, and in thin pieces quite transparent. It is generally of a deep blueish green, which is sometimes so dark as to appear almost black, and often of a dusky blue: it is likewise sometimes of so bright a
green,

green, that it is not inferior to the green jasper. The coats are fine, and beautifully disposed like the zones of an onyx, and are all bright and transparent. Some are of a bright white, others of a fine deep yellow, others of an agreeable pale flesh-colour, and others again of a bright deep red. The coats are very thin, and lie evenly throughout the whole substance of the stone; but the flesh-colour and white are most commonly near the nucleus, and the yellow towards the surface: however, it is subject to great varieties. It is more transparent than any other Pebble, and when broken is of a fine even flinty surface, capable of bearing the most perfect polish. It is common in many parts of *England*, in particular near *London* in the road to *Highbury*, and especially among the gravel in the foot-path from *Pancras* to *Kentish-Town*. It is sometimes used by our lapidaries, but not so much as it deserves.

The PEBBLE with whitish brown and yellowish coats, and a flesh-coloured nucleus, is of a fine and smooth texture, with a very firm, rough, unequal, thick crust, it being full of prominences and cavities. The shape is very irregular and uncertain, it being ragged and uneven in several parts, and looking more like a flint than a pebble. The size is from an inch to eight in diameter, and the nucleus is pretty large, with a shape like that of the stone itself. It is of an agreeable flesh-colour with a slight tinge of blue, and the coats are not above three or four in number; which are of a fine deep brown, a dusky white, and a pale and darkish yellow. The yellow coat lies next the nucleus, the white next to that, and then the brown; and in some a thick yellow coat lies over these, bounded by a very narrow one of deep brown. The surface is of a pale whitish brown, and extremely coarse, being often half an inch thick. This stone, like others, is subject to great variations. It is pretty transparent, and when broken it has a fine flinty surface; and it is so hard as to bear a very good polish. It may be met with in *Yorkshire*.

The PEBBLE with white and brown coats, and a white nucleus, is of a very fine close texture, with a

roughed unequal surface, having prominences like warts, with small irregular cavities and deep wrinkles. It is commonly of a roundish, oblong, flattish shape, and from two to three inches in diameter. The nucleus is bright and white, but not very clear; and the number of coats is uncertain, being sometimes three or four, and at other times six or eight; which are all of two colours, that is, a fine deep brown, and a very bright white. This stone is also subject to great variations, for the nucleus is often wanting, and a white matter is diffused in irregular veins, like those of agates. The brown parts are very bright and glossy, and pretty transparent; but the white is much more opaque. When broken it is bright and smooth, and being extremely hard will bear a pretty fine polish. It is very common in the gravel-pits of *Northamptonshire* and *Leicestershire*.

The PEBBLE with black, white, and flesh-coloured coats, and a red nucleus, is of an exceeding fine close texture, with a smooth even surface, the wrinkles being very superficial. The shape is generally roundish, and it seldom exceeds three inches in diameter. The nucleus is encompassed with many thin coats of a fine jet black, a clear white, and a flesh-colour. The black is commonly next to the nucleus, then the flesh-colour, and after that the white; but it is sometimes one, and sometimes the other: the rest follow alternately, though not always. The outermost coat is generally of a flesh-colour, and over that is the crust, which is very thin. The nucleus is of a fine bright transparent red, and equal to many of the best cornelians. The flesh-coloured parts are the most opaque of any in the stone; but the black coats are extremely beautiful, being very bright and glossy, and when thin are pretty transparent: however, this stone is subject to great varieties, and sometimes the nucleus is wanting. When broken the surface appears to be flinty, it being extremely hard, and capable of an excellent polish. It is not very common, but it has been found on *Hamstead Heath*, and in the gravel-pits of *Northamptonshire*.

The PEBBLE with yellow and greenish white coats, and a yellow nucleus, is of a very fine close texture, with a remarkably smooth surface, it having only a few superficial wrinkles. It is generally pretty round, and between one and three inches in diameter. The nucleus is small, but of a fine texture, a glossy surface, and pretty transparent. It is of the colour of the common yellow cornelian, and encompassed generally with but a small number of coats of two colours, namely, a yellow a little deeper than the nucleus, and a very pleasant whitish green; of which colour the coat next the nucleus always is, and after that is a yellow, next a green, and so on alternately. The outer coat, on which the thin crust is laid, is sometimes of a pale brownish white, but not always; besides which there are often other varieties. The nucleus and the yellow coats are transparent, and much more so than the green. It is extremely hard, capable of a fine polish, and readily strikes fire with steel, like the rest of this kind. It is very uncommon, but has been seen on the shores of *Yorkshire*.

The PEBBLE with purple and pale yellow coats, and a red nucleus, is of a fine firm texture; but the surface is remarkably rough, being full of inequalities, though it has but a few deep wrinkles. The shape is irregular, and the size various, some being less than an inch, and others four inches in diameter. The nucleus is also irregular, and of a strong deep red, though pretty bright and glossy, but with little transparency. It is surrounded by two or three coats of a fine pale yellow, and a purplish black colour; which last, held up to the light, appear of a fine deep purple. All parts of the stone are bright and glossy, but those that are yellow are most transparent, and there is generally a yellow coat next the nucleus: those that follow are commonly placed alternately, and are pretty thick; there is likewise a yellow one next the outward crust, which is white within, and yellowish on the surface. This stone, as well as many of the former, is subject to great varieties; but it is always exceeding hard, and when cut into plates is very transparent. It is very uncommon, but some have been

found on the shores of *Sussex*, and in the gravel-pits about *Oxford*.

The PEBBLE with grey and pale red coats, and a yellow nucleus, is pretty fine and firm, with a smooth even surface, only there are superficial wrinkles. It is generally roundish, and from one to six inches in diameter. The nucleus is of a dusky yellow, and commonly about the size of a hazle nut. It is opaque, and has a curdled look; and is surrounded by several coats of a pale red, placed alternately with some that are thicker, of a pale ash-colour or blueish grey, not unlike some of the paler flints. The pale red or flesh-colour is made so by a mixture of grey, and the outermost coat is usually of this last colour, over which there is a pale blueish grey crust. This also is subject to the like varieties with the rest; and it is coarse in comparison with one of the former, though it is pretty hard, and takes a tolerable polish. It is found in great plenty on the shores of *Yorkshire*, and sometimes in the gravel-pits about *London*.

The PEBBLE with red, purple, blueish, and brown coats, and a pale grey nucleus, is not of so fine a texture as any of the rest, though it is pretty smooth, and very firm, with a surface furrowed with deep wrinkles. It is commonly of a roundish shape, and about four inches in diameter. The nucleus is of a pale grey, or whitish ash colour, encompassed with a great number of thin coats of several colours, as a deep red, a bright purple, a greenish blue, and a glossy brown; these last are more transparent than any of the rest: but these, upon the account of their coarseness, have but a dull look, which renders the stone less beautiful. The coat next the stone is of a red colour, and thickish, but not clear or bright; next this is one of brown, but the rest of the coats are disposed without any regularity, though they are very prettily variegated. The outer coat is generally of a blueish grey, and thicker than the rest; but the crust is commonly very thin and whitish. It has a smooth flinty surface when broken. and is so hard as to take an even polish. It is not common, though it has been sometimes met with in *Hertfordshire*.

The PEBBLE with black and white coats, and a black nucleus, is of an exceeding fine close texture, with a rough surface, generally full of deep wrinkles and protuberances, of the size of a horse-bean. It is of a flattish round shape, and commonly four or five inches in diameter; the nucleus is pretty large, and of a fine glossy black. The coats are of a pearl colour, and black like the nucleus, and placed alternately; but the whitest are the thinnest, and the outermost is always black, and thinner than the rest. The crust that covers the whole is generally very thick, and seems to be of a coarse chalky substance. This is also subject to great varieties like the rest, and therefore hardly needs to be so often repeated. It is more transparent than any of the former, it being extremely hard, and when broken has a fine glossy surface. It will bear a very good polish, and like the rest strikes fire with steel, but will not ferment with aqua fortis any more than they. It is pretty common on the *Suffex* and *Yorkshire* shores. It is sometimes made into seals and other toys, and looks like an oriental stone.

The PEBBLE with brown and greyish black coats, and a yellowish brown nucleus, has a pretty fine firm texture, though the surface is pretty rough and unequal, and deeply wrinkled. It is commonly of a flattish round shape, and from two to six inches in diameter. The nucleus is large, and of a brownish yellow, or tawney, surrounded with a few thick coats, some of which are of a greyish black, and others of a pretty clear brown. The nucleus is generally surrounded with a pale grey coat, after which the brown and darker grey are placed alternately. The outermost coat is always brown, though but thin, and the crust that covers it is thin and blueish, but of a much paler colour on the protuberances, than on the other parts. It is not very transparent, but has a glossy surface when broken, and is so very hard as to be capable of a good polish. It is to be met with in the gravel-pits of *Hertfordshire*, *Buckinghamshire*, and *Northamptonshire*.

The PEBBLE with white and greenish coats, and a pale grey nucleus, is of a pretty fine texture, and

very firm, with a smooth surface, without many wrinkles. It is almost always round, and is from one to three inches in diameter. The nucleus is small and round, and encompassed with coats of two colours, some of which are entirely white, and others of a faint greyish green; but a white coat is generally next the nucleus. Sometimes these colours are blended with each other, and have undulated edges running through one another, to the succeeding coat: the outermost coat is of a paler or greyer green than the rest, and but thin, as well as the crust that lies over it, which is of a pale blueish ash colour. It is but little transparent, though it breaks with an even surface; however, it is so hard as to bear a pretty good polish. It is found on the shores of the river *Thames*, and sometimes in the gravel-pits about *Islington*.

The PEBBLE with yellowish brown and black crusts, with a brownish white nucleus, is the *Egyptian* Pebble of the lapidaries. It has an exceeding fine close texture, and the surface is not so wrinkled as many of our Pebbles. It is commonly of an oblong shape, though sometimes very irregular; it is of various sizes, but the most common seems to be about four or five inches long. The nucleus is of a very irregular shape, and of different sizes, but it is always of a pale whitish brown, and sometimes with veins or spots of a dusky colour. It is also often variegated with the colours of black trees, shrubs and mosses. When it is large, it spreads itself so much as to have some resemblance to a beast or fish, or at least some of their parts; likewise some have had the distinct representation of a human face. It is pretended that one in the museum of *Sir Hans Sloan*, exactly represents the features of the poet *Chaucer*; and that some have known it immediately to be such. However, the beauty of the stone is in a great measure owing to those oddnesses. The nucleus is commonly surrounded with a pretty thick crust, of a pale brownish yellow, and that by one of black; these are encompassed with others which are many in number, and partly black, and partly of a deeper or paler yellow. Every part is much of the same degree of purity, but, if any, the black is finer than

than the rest. It is met with in *Egypt*, *Arabia*, and some of the islands of the *Archipelago*. There is a sort of it in *Germany*, and some parts of *Sussex*, but they are not so fine as the *Egyptian*.

The PEBBLE with yellow and pale brown coats, and a deep green nucleus, is very beautifully variegated, but is not so pure as some of the former, and it is of a pretty coarse rough unequal texture, though it is pretty firm, and has a smooth surface, with very few wrinkles. It is generally roundish, and from one to five inches in diameter. The nucleus is large, and of a dark dusky green, surrounded by a number of crusts in different stones, which are also different in their thickneses. Some are of a deep yellow, and others of a pale whitish brown, disposed alternately; but one that is whitish, or very pale, usually surrounds the nucleus, and the outer coat is commonly yellow, and pretty thick; the crust is always whitish, and has a chalky look, but not very thick. The surface when broken is not very smooth, and yet it is so hard as to bear a good polish. It has been found on *Hampstead Heath*, and about *Kensington*.



C H A P. XXXII.

Of SANDS and GRITS.

FINE Shining White SAND is generally made use of to dry up the wetness of the ink in writing, lest it should blot, and for this reason is almost universally known. It is pretty fine, and is generally found very pure, and of a pretty fine white. It has some brightness, and if it be very good is a little sparkling, and the particles seem to be much of a size. It feels a little rough between the fingers, and settles very quick when mixed with water; but viewed through a microscope the particles appear to be of very different sizes and shapes, but they are all somewhat angular. They are all white, and though some are opaque, many are as transparent as crystal glass.

It

It makes no fermentation with aqua fortis, nor yet any of the rest, and therefore this circumstance needs not be repeated. It is found in many parts of *England*, in strata of great depth; but as there are some of yellow sand lying near it, it is no great wonder it should be sometimes mixed therewith. It is of great use in making glass, but not so good as that with flint; however, it does not require so laborious a process. Sands in general will serve for the same purpose, and they are made use of in some counties to manure stiff clay lands, for though they are barren of themselves, the lands; are rendered fertile by their mixture, because they are thereby made more susceptible of water, which otherwise would not penetrate stiff clay. This likewise is the principal part which bestows firmness to bricks, tiles and stone. It is also of great use in making mortar, which commonly unites the joints of bricks and stones, and renders them immovable. Likewise Sand mixed with mud or clay will make a sort of mortar, but less durable, though often used in the country for the walls of cottages. It is also Sand that gives a consistence to potters clay, for otherwise it would crack when wrought into vessels, and consequently fall in pieces, or at least the vessels would be useless. It sometimes serves for polishing the hardest bodies, and for cleaning those that are tarnished.

The Large Shining White SAND is coarse, with respect to the former, though it is generally very pure. It is of a pretty good white, with some brightness and sparkling, and seems to consist of regular uniform particles, which are harsh and rough to the touch. When mixed with water it settles immediately, leaving no foulness behind it. All the particles are of a somewhat oblong and irregularly angular shape, and when viewed through a microscope, the surfaces appear to be smooth, and as transparent as white glass. It is of great value among those that make glass, and is commonly brought out of *Kent* to *London*.

Fine White very Shining SAND is the best of all of that colour, it being perfectly pure, pretty heavy, and of a pure white, and is very remarkable for its lustre.

It

It is composed of very uniform particles with even surfaces, and is extremely hard. When thrown into water it sinks immediately, without leaving foulness behind it. When viewed through a microscope the particles appear to be a little oblong, and of irregular angular shape, with a fine clear water, it being little inferior to the purest crystal; and indeed this and the two former are entirely of that substance, except, as some suppose, there is a small mixture of white earth. It is found on the shores of most of the rivers in *Italy*, and is of great value in glass-making. Some affirm, it glitters by candle-light like so many small diamonds.

Fine brownish white dull SAND is pretty heavy, but does not shine to the naked eye, for it appears rather like a heap of fine dust. The particles seem to be very regular and uniform with regard to their size and shape; however, when it is mixed with water it does not subside with such speed as the former, and it leaves a whitish muddiness behind it. When viewed by a microscope, the particles appear to be of different shapes and sizes, but chiefly roundish, some of them having rough surfaces, and others flatish; but they are all more or less transparent. It is found in *Sussex* and *Kent*, but is not made use of for glass, because better sorts are plenty.

Yellowish White Fine Dull SAND is pure, fine, and pretty heavy; but it has no brightness. The particles are very small, and seemingly very uniform and regular: to the touch it seems to be softer and finer than most other sands, and yet mixed with water it soon subsides to the bottom, but leaves a yellowish muddiness behind it. When viewed through a microscope, the particles appear to be of irregular shapes, though they have somewhat of a roundness, and the surfaces of many are rough; they are transparent in different degrees, and the colour is not quite the same in all, for some are almost without any. It is met with in all parts of the world, and some pretend the desarts of *Arabia* are covered with this sort, which, however, is very uncertain, because it may be doubted whether it has ever been brought to *England* or not.

Red-

Reddish White very Fine Dull SAND, though extremely fine, is pretty heavy, and of a whitish colour, tinged with a little flesh-colour. It has not the least brightness, and the particles seem to be all of a size, though they are exceeding small, and they feel harsh to the touch. Shaken together with water, it subsides very slowly, but when thoroughly settled it leaves no muddiness behind; however, when viewed through a microscope, the particles appear to be of different shapes and sizes, some of them being at least twenty times smaller than the rest. They are all more or less transparent, and some of them are perfectly so. There are some of this sort in *England*, particularly in *Suffex*.

Large Brownish White Shining SAND contains a mixture of coloured particles, and is coarse, heavy, and of a colour which seems to be made up of a mixture of brownish, yellowish and whitish, with a faint reddishness. It is very bright, and its particles, though of different colours, seem to be much of a size to the naked eye. When shook with water it immediately settles, without leaving any foulness. When viewed through a microscope, the particles still appear to be much of a size, and of an oblong shape with angular edges; but there are some that are roundish, and of a fine clear yellow; some dusky, but very beautiful, and some of a pale flesh-colour. The white particles are perfectly transparent, but the reddish are almost opaque. It is found at *Hedgerly* near *Windfor*, where it lies among loam.

Large Yellowish White Shining SAND consists of pretty large coarse particles, which are very heavy, though somewhat less than the former. It is very clean and remarkably bright and shining, and it feels very harsh between the fingers; when mixed with water it subsides immediately without leaving any muddiness. When the particles are viewed through a microscope, they appear to be of all shapes and figures, though in general they have a tendency to roundness; but they are much of the same size. They are generally transparent, and are chiefly white, which are mixed with some of a pale yellow or lemon colour.

It

It is found all over *England*, and particularly near *Deptford*, *Highbury* and *Hampstead*.

Large Coarse Shining Variegated SAND is a very common sort, and is a very beautiful Sand, though not pure. It differs in its coarseness and fineness, and in the different shapes of the particles. It is pretty heavy, and of a transparent white colour, variegated with black, red and brown, and of a chalky white, as also with different shades of yellow. The white particles, which are much the most numerous, have a considerable brightness, and it feels very hard, tho' not so rough as some others. When viewed through a microscope, it appears to be mixed with small pebbles, that are opaque and of different colours, besides fragments of larger pebbles and flints, with many pieces of the white opaque crusts of flints. It is sometimes found in strata by itself, and at other times mixed with gravel. That on the sea shore is always clean and bright, and mixed with fragments of shells; in this last case it will ferment with aqua fortis, which is owing to the shells mixed therewith.

Fine Dull Brownish White SAND, with heterogeneous particles, is of a dead disagreeable colour; but is pretty fine, though not so heavy as many other Sands. There is little or no brightness, excepting a very few white glittering particles, which are here and there interspersed, and which are certainly of a different nature from the other particles. The principal part seem to be pretty uniform with regard to their size, and the whole does not seem so harsh as other Sand; when shook together in the water it subsides but slowly, and leaves a brownish foulness behind it. The shining particles, when examined by a microscope, appear to be fragments of talc, for they will not ferment with aqua fortis. It is common almost every where, and is mixed with lime and hair to make mortar for plastering walls and ceilings.

Fine Dull Greenish White SAND with heterogeneous particles is pretty fine, though it has a dirty look, and the heterogeneous particles are not many. It is very heavy, is of a deep brownish white colour with a sort of a greenish cast, and does not at all glitter,
except

except where the heterogeneous particles lie, which are certainly of a talcky nature. The other particles are not all of the same size, and the whole feels hard and harsh between the fingers; when mixed with and shook up with water it settles but slowly, and leaves a whitish brown muddiness. When examined by a microscope it appears to consist of particles of all shapes and sizes, but mostly with smooth surfaces, and of a different colour. They are generally transparent and of a glossy white; but there are many of a sort of greenish brown, and not so transparent. It is common near *Deptford*, *Black Heath* and *Woolwich*. This is pretty much used for the making of green glass.

Fine Glittering Greyish White SAND with heterogeneous particles, owes its brightness to the great quantity of talc it contains; for the sandy particles are small and fine, and seem to have little or no transparency. It is pretty heavy, and the particles are irregular in their sizes, but all of them small. The talc also is of different sizes, but larger than the sand, though at the same time very thin. It feels hard and harsh between the fingers, and when it has been mixed with water and shook up, it subsides in a short time, and leaves the water clear. When examined by a microscope, the particles seem to be of three different kinds; for besides the talc, there are some that have a glossy appearance, and a few that consist of an opaque spar, for which reason it will ferment a little with aqua fortis. It is found on the shores of the islands of *Scilly*.

Large Shining Red SAND consists of large coarse heavy particles, and is of a strong red, approaching to a deep orange colour. It is not quite so bright as some of the white sands, but the particles which compose it seem to be pretty much of the same size, though of various shapes, with a tendency to roundness. It feels extremely hard and harsh, and when mixed with water subsides immediately, leaving it clear. It is a foreign sand, and perhaps is particular to the island of *Santorini*.

Large Shining Flesh-coloured SAND, is pretty coarse and very heavy, and is of a bright agreeable
pale

pale red, or rather of a flesh-colour. It is remarkably bright and sparkling, and the particles appear to be pretty much of the same size, though all not exactly of the same colour. It feels very harsh and rough, and when mixed with water subsides immediately, leaving no foulness behind. When examined with a microscope some have glossy surfaces, others are quite transparent, and others again intirely opaque; many are semi-transparent, and with regard to the colours some are white, others yellow, and others of a pale red. It is common near *Naples*.

Coarse Shining Brownish SAND, with a reddish cast, consists of large but pure particles, which are very heavy, and seemingly roundish. It is remarkably bright and sparkling, and the particles are of very different sizes. It is no wonder it is very rough to the touch, nor that it subsides immediately in water. It is common on the heaths of *Sussex* and *Buckinghamshire*.

Fine Bright Shining Brownish Red SAND is very heavy, and the brown colour is more predominant than the red. The particles seem to be nearly of the same size and shape, and it feels harsh to the touch; when mixed with water it sinks pretty soon, and leaves a whitish muddiness behind it. It is met with in many parts of *England*, and particularly on *Hampstead Heath*.

Very Fine Pale Shining Brownish Red SAND is not of an agreeable colour, but is pure, though not so heavy as many other Sands. It is pretty bright and shining, considering its fineness, and the particles are of different sizes. It is pretty hard to the touch, and subsides but slowly in water, leaving a reddish brown muddiness behind it. It is common on the heaths of *Sussex*.

Very Fine Pale Red SAND with heterogene particles is remarkably fine, heavy, and of a very pleasant colour, which consists of a mixture of white, pale brown, and pale red. It glitters pretty much, and is composed of small uniform particles with a slight mixture of talc. It is harsh to the touch, and when mixed with water settles but slowly. When

examined by a microscope, the particles appear to be roundish and quite transparent. In the fire it loses all its redness, which is a circumstance not very common. If we may credit our author, it is only found in the deserts of *Arabia*; but how he should know this we are at a loss.

The Fine Palish Brown Yellow SAND makes but a dull appearance, though it is pure, fine, and pretty heavy. The colour seems to be made up of white, pale brown, and pale yellow, which are all very dull. The particles are of different sizes, and so small that they seem soft to the touch, and settle very slowly in water, leaving a whitish muddiness. When examined with a microscope some of the particles appear to be perfectly transparent, and others almost opaque. It is very common all over the kingdom.

The Fine Shining Pale Yellow SAND is pretty fine, heavy, and of a fine colour, made up of white, yellow and reddish brown. It is bright and shining, and the particles seem to be pretty uniform. It is rough to the touch, and settles but slowly in water, leaving a yellowish muddiness behind it. When examined by a microscope, the particles are found to have different degrees of transparency, and those that are angular are as clear as crystal. It is found about *Hampstead* and *Highbate*.

The very Fine, Shining, Pale Yellow SAND is considerably heavy, and there is no mixture of any other colours with the yellow. It is also very clean, with uniform particles, which shine pretty much. It is harsh to the touch, and when mixed with water quickly subsides, and leaves it clear. It is found in *Kent* and *Sussex*, and other parts of *England*.

The Fine Shining Gold-coloured SAND is very pure, fine, and heavy, and is of a fine bright yellow resembling the colour of gold. It glitters pretty much, and seems to consist of uniform particles. It is harsh to the touch, and settles immediately in water, leaving it clear. It is common on *Hampstead Heath*, and in most other parts of the kingdom.

The very Coarse, Shining, Pale Yellow SAND consists of very large heavy particles, and is generally
pure

pure, with a uniform colour. It glitters very much, but the particles are irregular with regard to their size. It is very rough to the touch, and subsides in water immediately. This is commonly called Scouring Sand, and is used by stone-cutters in cutting their hard stones: it also serves to polish those that are designed for the more curious sort of pavements. It is common in most parts of the Kingdom, and particularly may be met with at *Hampstead* and *Highgate*.

The very Coarse, Dull, Whitish Yellow SAND is generally found among gravel, and is remarkable for its coarseness. It seems to have no brightness, unless viewed very nearly; and its particles are of very different sizes. It is common about *London*, and in most other parts of the Kingdom.

The Large Shining Yellow SAND is also common among gravel, and is quite pure, though coarse and heavy. It shines pretty much, and the particles are pretty regular with regard to size. It is extremely coarse to the touch, and when mixed with water settles immediately, leaving it clear. When viewed through a microscope it seems to consist of particles like small pebbles, with pretty smooth surfaces. It is common about *London* and other places.

The very Coarse Bright Yellow SAND is always found at considerable depths, and is perfectly pure, though remarkably coarse and rough. The particles are heavy and regular in their size, and perhaps it feels the roughest of all Sands; when mixed with water it settles immediately, leaving it clear. Viewed through a microscope, it appears to consist of large crystalline particles of an amber colour, and of the shape of pebbles. It is found in *Northamptonshire* and other places, under the strata of gravel.

The Large Dull Yellow SAND is of a disagreeable colour, though generally pure. It is considerable coarse, very heavy, and of a little deeper yellow than the former, but is very far from being so bright. The particles are of a very irregular size, and though considerably hard they do not seem so harsh as any of the former. When mixed with water they quickly subside, leaving a little yellow muddiness. When viewed

viewed by a microscope, the particles seem to resemble pebbles, but many of their surfaces are very unequal and somewhat flattish, and others crooked. It is a common Sand, and is found not only in pits, but on the shores of the *English* rivers. It is used by the plumbers in *London* as a bed whereon to cast their sheet lead, and it is generally brought from *Hackney* river. It is also used by stone-cutters in sawing their marble.

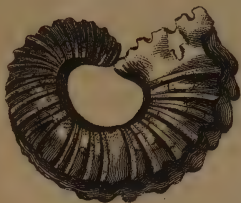
The Fine Dull Deep Yellow SAND is pretty fine, though the particles are of different sizes. It is lighter than most other Sands, and the deep yellow colour is entirely without brightness. It is soft to the touch, and when mixed with water it subsides very slowly, leaving a yellow muddiness behind it. When viewed through a microscope the particles seem to be of the shape of common pebbles, with very irregular surfaces; they are pretty transparent, and of an amber colour. Some of the particles are so small that they appear like dust sticking to the surfaces of the rest. It is common in *Wiltshire*, and is found in other parts of *England*.

The Very Large Dull Saffron-coloured SAND is very pure, hard, coarse, and pretty heavy, and of a deep strong bright yellow. The particles are not all of the same size, and it is hard and rough to the touch: when mixed with water it subsides immediately, leaving it clear. It is found on the *Gold Coast* of *Guinea* in *Africa*.

The Coarse Shining Dirty Yellow SAND is very pure, large, coarse, heavy, and of a deep dusky yellow. The particles glitter pretty much, and they seem to be regular and uniform, with regard to their size. It is harsh and rough to the touch, and when mixed with water quickly settles, leaving it clear. When viewed by a microscope the particles appear in the shape of pebbles, and are pretty transparent, though of different degrees of yellow. It is common in *Hampstead Heath*, and many other parts of the kingdom.

The very Coarse Brownish Yellow SAND is very large, harsh, and considerably heavy; the colour is of
a deep

Ammon's Horns



Horse Head Stone



Bucardites 313.



a deep, dusky, brownish yellow, but very bright and sparkling. The particles with regard to size and shape are very regular, and it is exceeding harsh to the touch; when mixed with water it soon subsides, and leaves a brownish yellow muddiness. When viewed through a microscope, the particles appear to be uniform, and in the shape of pebbles, with very uneven surfaces, but pretty bright and transparent. It is common among the gravel in many parts of *England*.

The Fine Greenish Yellow Pale Dull SAND is very fine, and of a faint straw-colour, with a mixture of green particles, which are generally the largest. The sizes are very irregular, and it is soft to the touch, when mixed with water it subsides slowly, and leaves a white muddiness therein. When viewed through a microscope the particles appear to be different in shape, size and colour, and the greatest part have uneven surfaces. Some are of the colour of sulphur, others without any colour at all, both which are very transparent; but the largest are in shape like common pebbles, without much transparency, and of a deep dusky green. It is found on *Hampstead Heath*, and many other places.

The Fine Greenish Red Pale Dull SAND in many respects resembles the former, but it is considerably lighter than most others, and of a pale yellowish flesh colour, with a mixture of green specks. The particles are of different sizes and shapes, those that are green being considerably larger than the rest, and it is hard and rough to the touch. When mixed with water it subsides but slowly, and leaves a yellowish brown muddiness therein. It is common in *Suffex*.

The very Coarse Shining Blackish Yellow SAND is large, coarse, considerably heavy, and of a deep yellow, but mixed with black particles. It is very bright and shining for one of this kind, and the particles are nearly of the same size, only those that are black are a little smaller than the rest. It is remarkably rough, and harsh to the touch, and when mixed with water settles immediately, leaving it extremely clear. When viewed by a microscope, the particles appear

pear in the shape of common pebbles, and are very bright and transparent, except the black, which are almost opaque. It is common in the sand-pits about *Tyburn*, and elsewhere.

The Fine Shining Blackish Straw-coloured SAND is neither large nor heavy, and the straw-coloured particles are mixed with those that are black. It is very bright and shining, considering the smallness of its particles; but these are of different sizes, and those that are black are somewhat larger than most of the rest. It is hard to the touch, but not very rough, and when thrown into water subsides very soon, leaving a little brownish muddiness therein. When viewed through a microscope, the particles appear to be of an oblong, blunt, angular shape, and are all very transparent and bright; and even the black particles, which are not very numerous, have some degree of transparency; but they are of a roundish shape, with smooth surfaces. It is common in *Suffex*, and may be met with in many other places.

The Shining Coarse Blackish Sulphur-coloured SAND is hard, heavy, and of a fine brimstone colour, with a considerable mixture of black. The particles are bright and shining, but irregular with regard to size, and they are very harsh and rough to the touch; being mixed with water it subsides immediately, leaving it clear. When viewed with a microscope, the particles appear to be in the shape of pebbles, but are very transparent, and the black seems to be nothing else but fragments of dark coloured flints, and is common in the sand-pits on *Hampstead Heath*.

The Shining Fine SAND, of a rusty yellow colour, is pretty fine, very heavy, and of a deep dusky yellowish brown, with a mixture of white particles, and others that have no colour at all. The brightness is owing to the last mentioned particles, for those that are yellow and brown are entirely dull. They are all very irregular with regard to their size and shape, and are very harsh to the touch: being mixed with water they subside very soon, and leave a muddiness therein as if mixed with ochre. When viewed through a microscope they all appear to be somewhat angular,
and

and the greatest part are of the colour of rusty iron, and entirely opaque.

The Finest Brown Yellow SAND with heterogeneous particles is pretty fine and light, and of a pale brownish yellow colour, with small spangles of talc, which are not very numerous, is sharp and harsh to the touch, and when mixed with water subsides slowly, but leaves them clear. When viewed with a microscope the particles appear to be roundish, with unequal surfaces nearly of the same size, and very bright and transparent. The spangles appear to be thin flakes of fine talc, having the appearance of silver. It is common in the sand-pits on *Hampstead Heath*.

The Very Fine Yellowish Flesh-coloured SAND is very heavy, and the colour seems to be made up of a pale yellow, and a very pale red : when mixed with a great number of small glittering particles, those that are sandy have also some brightness, and are pretty uniform with regard to size ; when mixed with water it subsides very slowly, leaving a yellowish muddiness therein. When viewed with a microscope the particles appear to be pretty much of the same size and shape, but of different degrees of transparency ; some are reddish, others yellowish, and some transparent ; they are of the shape of common pebbles, and the yellow much more bright and transparent than the red. The spangles are exceeding small, and appear to be thin flakes of talc. It is common in *America*, and is to be met with in some parts of *England*.

The Coarse Straw-coloured SAND, with heterogeneous particles, is very heavy, and of a pleasant pale yellow, with a considerable brightness, and pretty large white spangles. It looks very clear, and consists of regular particles, with regard to the size. It is sharp to the touch, and when mixed with water it subsides immediately, leaving it clear. When viewed through a microscope the particles appear to be roundish, very bright and transparent, and the spangles are pretty large thick flakes of talc. It is common in the sand-pits about *London*.

The Coarse Sulphur-coloured SAND with heterogeneous particles, are pretty heavy, and of a fine pale

colour, somewhat between sulphur and saffron; it abounds with a great number of flat glittering spangles, which are broader than the other particles. It is harsh and rough to the touch, and when mixed with water subsides immediately, leaving it clear. When viewed through a microscope the particles appear to be irregular in their size and shape, and many of them are not very transparent, though most of them are very bright. The shape is like that of common pebbles, and the spangles appear to be fine thin flakes of talc. It is common in *Italy*, and may be met with in *Suffex*.

The very Coarse extremely Shining Yellow SAND with heterogeneous particles, is very heavy, and of a fine yellow, though a little deeper than the ordinary pale gold colour. It glitters very much, and has also a great number of glittering spangles. The particles are regular and uniform with regard to the size, and it is rough to the touch; being shook in water it subsides in a moment, and yet it leaves a little yellow muddiness therein. When viewed through a microscope the particles appear to be very like small pebbles, and are all pretty transparent. The spangles are pretty numerous, but more white and less transparent than in many other of these Sands, because they are more thick; besides, they do not appear to be talc, but the fragments of selenites. It may be met with on *Hampstead Heath*, and in many other parts of the kingdom.

The Fine Dusky Yellow SAND with heterogeneous particles is pretty fine, but not heavy, and somewhat of a brownish yellow. It has a very dull look, but is mixed with glittering spangles, and the particles are very irregular with regard to their size; however, the spangles are very few, upon which account it has a more dead look than many others. It is soft to the touch, and subsides but slowly in water, leaving a yellow foulness therein. When viewed through a microscope the particles appear of various sizes, with unequal surfaces, resembling small pebbles. The spangles consist of very thin talc. It is common in the sand-pits about *London*, and in many other places, and
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is generally mixed with ocherous clay, unless when found on the shores of rivers.

The Large SAND of a yellow gold colour, with heterogeneous particles, is hard, coarse, and pretty heavy, and of a deep yellow colour, between saffron and gold. The particles are pretty bright and shining, but irregular with regard to their size, and the white spangles are but few, which are large and bright. It is harsh and rough to the touch, and subsides immediately in water, leaving a little yellow foulness therein. When viewed through a microscope the particles appear in the shape of pebbles, and are very transparent, and of a fine yellow colour: the spangles consist of flat fragments of selenites. It has been met with in *Northamptonshire*, *Kent* and *Sussex*.

The very Coarse Saffron-coloured SAND, with heterogeneous particles, is pretty heavy, and of a fine strong saffron colour, or rather of a deep reddish yellow. The particles themselves are without brightness, but it is full of glittering spangles of talc. The particles are very irregular with regard to size, and they are pretty harsh to the touch; when mixed with water they settle very slowly, leaving a yellow foulness therein. It is common in *Germany*, and has been found in *Sussex* and *Leicestershire*.

The very Fine Dusky Saffron-coloured SAND with heterogeneous particles is very fine, and not heavy; the colour is a dusky brownish yellow with somewhat of a brightness; but the numerous spangles of talc make it appear greatly so. The particles are pretty regular with regard to size, and the spangles are but little broader than they. It is harsh to the touch, settles slowly in water, and leaves a brownish muddiness therein. When viewed through a microscope the particles appear to be small, and in the shape of pebbles, but not very transparent; the spangles appear to be thin flakes of talc. It is common in the sand-pits about *Highgate* and *Hampstead*, and in other parts of the kingdom.

The very Fine Brown Dull SAND consists of fine particles, which are not very heavy nor bright, inso-much that they appear like a heap of dust; however,

they are pretty regular and uniform with regard to size, and are harsh to the touch; in water it subsides but slowly, and leaves a muddiness therein. Through a microscope the particles resemble small pebbles with unequal surfaces, and they are pretty transparent, but not bright. It is met with in the sand-pits about *Woolwich* and *Blackheath*.

The very Coarse Shining Pale Brown SAND is one of the coarsest that is met with in this kingdom, though it is not remarkably heavy. The particles are pretty bright and sparkling, and regular with regard to size. It is very coarse and hard to the touch, and mixed with water subsides immediately, leaving it clear. It is common about *Woolwich*.

The very Coarse Shining Dusky Purple SAND is very large and heavy, and of a deep purplish brown or chocolate colour interspersed with white. The brightness is in a great measure owing to the white particles, and it is very rough to the touch; when mixed with water it subsides almost immediately, leaving a somewhat yellow muddiness therein; thro' a microscope the particles appear to be much of the same size and shape, being roundish. They are of two different colours, that is, chocolate colour and white, which last are always smooth, and the former rough. It is to be met with near the *Hot-Well* at *Bristol*.

The Dull Brown Coarse SAND with heterogeneous particles is pretty heavy and of a pale brown, but very dull. The particles are irregular with regard to size and colour, some being much browner and coarser than the rest. When mixed with water it subsides immediately, leaving it clear. When viewed through a microscope, the particles appear of different shapes and sizes, but chiefly like pebbles, and pretty bright and transparent. There are flattish fragments among them, which seem to be a sort of flint of different shapes, and there are others which are fragments of spar, upon which account it will ferment with aqua fortis. It is met with near *Oxford*.

The very Coarse Shining Pale Brown SAND with heterogeneous particles is large, pretty heavy, and
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of a faint pale brown colour; the particles are bright and pretty uniform with regard to size. It is harsh to the touch, and mixed with water subsides immediately, leaving it clear. When viewed through a microscope, the particles appear to be of different shapes and colours, some being opaque and blueish, others transparent and inclining to yellow; but the greatest number are in the shape of pebbles with smooth surfaces, and of different degrees of a pale brown. Also there are many fragments of white brown transparent spar, upon which account it will ferment a little with aqua fortis.

Small Shining Greyish Black SAND is perfectly pure and considerably fine and heavy; the colour is of a bright greyish black, and has a very agreeable look, the particles being uniform both with regard to shape and size, and of a considerable brightness. It is harsh to the touch, and when mixed with water settles but slowly, though it does not leave the least foulness therein. When viewed through a microscope it appears to be very bright and quite transparent, the particles appearing to be of an obtusely angular figure, and without any manner of colour. It is brought from *Italy*, where it is common.

The Fine very Shining Reddish Black SAND is clean, heavy and of a shining black, variegated with pale red, flesh-colour and white. The brightness is inherent in the particles it consists of, which are nearly of the same size, though different in shape; those that are black appearing roundish, and the others flat. It is sharp and harsh to the touch, and when mixed with water settles immediately, leaving it very clear. Viewed through a microscope, the particles appear like different gems; those that are black are almost opaque, with smooth surfaces and pretty round, but the others are all very bright and quite transparent, some being roundish and others flat. It has been hitherto found only in *America* on the sides of hills and the shores of rivers.

The Coarse Dusky Green SAND variegated with white is pretty heavy, coarse, and of a deep dull green, with a considerable number of white particles.

They are all nearly of the same size, but of different shapes. It is uncommonly harsh to the touch, and when mixed with water settles immediately, leaving it entirely clear. Viewed through a microscope the white particles appear to be of two sorts, some of which are half transparent and cloudy, with obtuse angles, and others have sharper ridges, but are bright and quite without colour, besides which there are a few tinged with a faint yellow. The green particles, which are most numerous, are of a deep yellowish green, and of various shapes, and are divided into lesser pieces by partitions of a whitish spar pervading the whole substance of some, and lodged on the surfaces of others; but if this be really a spar, what is the reason it will not ferment with aqua fortis? It is brought from *Virginia*, where it is common.

The Fine Snow-white Stony GRIT is a perfectly pure and homogeneous substance, fine and small in proportion to its weight. Its particles are very bright and sparkling, and very regular in the size. It is harsh to the touch, subsides immediately in water, and leaves it quite clear. It ferments violently with aqua fortis, for which reason it seems to be composed of a very fine spar. It has been found in *Mendip Hills* in *Somersetshire*, in the perpendicular fissures of the strata of stone.

The Dull Coarse White Stony GRIT is much inferior to the former; for though it is perfectly pure, it is very hard and coarse. The colour is dull, there being little or no brightness, but the particles are very regular with regard to their size. It is hard to the touch, and in water subsides immediately, leaving it of a sort of milky colour. This also ferments briskly with aqua fortis, and therefore must consist of spar. It is met with in the same places as the former.

The Fine Cream-coloured Stony GRIT is pale, very heavy, and of a yellowish white or cream colour. It is very bright and sparkling, and consists of particles that are irregular with regard to size. It is harsh to the touch, and in water subsides immediately, leaving it a little milky. Viewed through a microscope,

scope, the particles appear to be of different shapes and sizes, but all approaching to a rhomboidal form. They are all pretty transparent and bright, and seem to be without any colour. It consists of spar, for it will ferment violently with aqua fortis. It is found in one of the islands of the *Archipelago*.

The very Coarse Bright White Stony GRIT is very impure, and consists of two sorts of particles. It is very heavy, and of a dusky white colour, which however glitters in some places. The particles are all large, but very different in size, shape and colour. It is hard and harsh to the touch, and in water leaves a little milky foulness. Viewed through a microscope it appears to be composed of a confused mixture of crystalline and sparry particles; the former of which are angular, transparent and bright; but the others are white, opaque, and of a rhomboidal shape. It ferments strongly with aqua fortis, and a thin stratum of it has been found near *Loughborough* in *Leicestershire*.

The Very Coarse White Stony GRIT with heterogeneous particles is considerably heavy, and of a pure white, with black, yellow, and white flakes of talc. It is harsh and gritty to the touch, and subsides immediately in water, leaving a little whiteness therein. When viewed through a microscope it appears to consist of large irregular particles, pretty transparent, and very white. The particles of talc have all very glossy surfaces, though of different kinds. It will not ferment with aqua fortis. It is common in *Wales* on the sea shore under cliffs.

The Dull White Fine Stony GRIT is pretty fine, heavy, and of a dull whitish colour, with particles that appear to be much of the same size. It is rough to the touch, subsides quickly in water, and leaves a foulness therein. Viewed through a microscope it appears to consist of opaque particles with rough surfaces, and of no certain shape. Among these there are a few loose specks, with surfaces as bright as crystal. It ferments violently with aqua fortis, and is entirely white when burnt. It is common in *Derbyshire*, and other places where there are strata of stone.

The Dull White Coarse Stony GRIT is hard, pretty heavy, and void of brightness; and the particles are of different sizes and shapes. It is coarse and hard to the touch, and when mixed with water subsides immediately, leaving a muddiness therein. Viewed through a microscope the particles appear to have rough surfaces, and are quite opaque; but there are a few very small shining crystalline specks. It ferments very strongly with aqua fortis, and when burnt is entirely white. It is common in *Yorkshire*, and some other counties; where there are very large strata of it.

The Brownish White Fine Stony GRIT resembles the former, is pretty fine, but not very heavy, and void of all manner of brightness. The particles differ both in shape and size, and are not very rough or hard to the touch. When mixed with water it leaves a muddiness therein after the subsidence. When viewed through a microscope the particles seem to be of a loose spongy texture, and opaque, only there are a few shining specks in some parts. It is met with in the great stone quarry near *Bath*, in the cavities of the stone, and it ferments briskly with aqua fortis. It is also common in *Leicestershire*.

Glittering Greyish White Fine Stony GRIT with heterogeneous particles, is pretty fine, heavy, and of a pleasant pale greyish white. The particles are mixed with fine shining white spangles, and are different with regard to size, without the least brightness. The glittering proceeds from the mixture of a considerable quantity of talc. It is hard and rough to the touch, and when mixed with water subsides but slowly, leaving a whitish muddiness therein. When viewed through a microscope the particles appear to be different, both with regard to size and shape, and besides the talc there are a few crystalline specks. It ferments violently with aqua fortis, and is common in the hills of *Yorkshire*.

Greenish White Stony GRIT with heterogeneous particles is pretty fine, very heavy, and of a dusky greenish white colour. The particles are different both with regard to size and shape, without any brightness;

ness; but there is a mixture of broad flat particles of talc, which makes it glitter pretty much; it is not very rough to the touch, and when mixed with water it subsides but slowly, leaving a greyish muddiness therein. When viewed through a microscope it appears to consist of stony particles, which are different both with regard to their shape and size; but they are pretty transparent and bright, and the white talc appears in flakes. It will not ferment with aqua fortis, and when burnt is of a pale brownish colour. It is met with in some parts of this Kingdom.

The Coarse Greenish Grey Dull Stony GRIT, with a few heterogencous particles, is very large, harsh, pretty heavy, and of a dull greenish grey colour, intermixed with a very few talky spangles, which are much less than the stony particles, that are alike both with regard to their size and shape. It feels pretty harsh and rough, and subsides immediately in water, leaving it quite clear. When viewed through a microscope the whitish coarse particles, though not bright, are a little transparent, and there is here and there a crystalline speck, besides the particles of talc. It will not ferment with aqua fortis, and it burns to a pale dusky red. It is common in *Yorkshire* and other places.

The GRIT called the Puteolan powder by the ancients, is a sort of greyish powder, composed of particles which are so exceeding small, that viewed through the best microscopes, no distinction appears among them. It looks perfectly dull of itself, for what brightness there is may be probably owing to the talky particles. When mixed with water it subsides very slowly, leaving a great whitish muddiness therein. When mixed with salt water it soon dries into a hard stony mass, which will not afterwards easily dissolve when mixed with common water. It was used by the ancients as a mixture for their cements of buildings near the sea, or, as some say, those that stood therein. It is now known by the name of the Pozzolane, and is an ingredient of hard plasters, in several parts of *France* and *Italy*. It will not ferment with aqua fortis, from whence it appears there is no spar among it.

Fine Pale Reddish Stony GRIT is pretty fine, heavy, and of a very pale whitish or brownish red; it is very bright and sparkling, and even to a greater degree than many of the sands. It is harsh and rough to the touch, and mixed with water subsides immediately, leaving it entirely clear. The particles when viewed through a microscope appear to be of irregular shapes, some of which are of a pale red, others brownish, and others without any colour at all. It ferments slightly with aqua fortis, and undergoes little change in the fire. It has been found near *Bristol*.

The Pale Red Shining Coarse Stony GRIT is pretty heavy, and of a pale whitish red, with particles that are regular with regard to their size, and remarkably bright. It is very harsh to the touch, and immediately subsides in water, leaving it extremely clear. When viewed through a microscope the particles appear to be crystalline and quite transparent, but of irregular shapes; some of them are without colour, and others are of a very pale red. It will not ferment with aqua fortis, nor will the fire produce any great change. It is found on the coast of *Fife*, in *Scotland*.

The Greyish Red Coarse Shining Stony GRIT is very heavy, and the particles are of various shapes and sizes, many of which are very bright and shining, and others quite opaque. It is very harsh and hard to the touch, and immediately subsides in water, leaving it very clear. When viewed through a microscope some of the particles appear to be white, and very opaque; others are without colour and transparent, and others again are stained with a pale red. It ferments strongly with aqua fortis, and burns to a fine red. It is found on the shores of the island of *Minorca*.

The very Coarse Greenish Red Dull GRIT is very heavy, and of a fine flesh colour, variegated with green. The particles are pretty uniform and regular, with regard to their size, and they are of an irregular angular shape. It is very hard to the touch, and subsides immediately in water, leaving it clear. Through a microscope some of the particles appear to be whitish, others of a pale red, and others of a fine light green;

green; but they are all pretty transparent. It will not ferment with aqua fortis, and is found on the shores of the *Mediterranean* sea.

The Fine Shining GRIT of the colour of rusty iron, but darker, is full of spangles that appear bright and glittering, which are not talc but crystalline, and without any colour. They are much of the same size, and extremely harsh to the touch; they subside very soon in water, leaving it extremely clear. Through a microscope the particles appear to be of different colours, for some are whitish, others yellowish and semi-transparent, and others without any colour, and as bright as crystal; but the greatest number are brown. It will not ferment with aqua fortis, and is found near *Lisbon* in *Portugal*.

Fine Red Stony GRIT with heterogeneous particles is very heavy, and of an agreeable red colour, with a whitish cast. The stony particles are a little bright, but the mixture of glittering flat spangles renders the mass extremely so. All the particles seem to be uniform with regard to their size, and are very rough to the touch; in water they subside immediately, leaving it quite clear. Through a microscope the particles of this grit appear to be transparent crystal, of a pale red, and all somewhat angular, interspersed with very bright transparent particles of brownish white talc. It will not ferment with aqua fortis, nor will the fire change its colour. It is found on the shores of the island of *Minorca*.

The Coarse Red Variegated GRIT with heterogeneous particles is very bright and heavy, though light and coarse; the colour is variegated, though the red predominates, and the particles of that part are very bright and sparkling; besides these there are many white crystalline fragments, and a vast variety of yellow and black flakes of talc, all which glitter very much, and give the whole a very pleasing appearance. They are all nearly of the same size, and feel extremely harsh and rough; and in water they subside immediately, leaving it clear. It will not ferment with aqua fortis, but it becomes somewhat redder in
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the fire. It is found on the shores of the island on the coast of *Scotland*.

The very Coarse extremely Shining Flesh-coloured Variegated GRIT, with heterogeneous particles, is more beautiful than the former, and pretty heavy. The flesh colour or pale red is very lively, and variegated with black and brown particles of talc, besides some that are white and crystalline; and all the particles in general are very bright and glittering, and very irregular with regard to their size. It is very hard and harsh to the touch, and subsides immediately in water, leaving it clear. When viewed through a microscope the particles all appear to be large and coarse, but of very different shapes and colours, though some are reddish and yellowish, others without colour, and others again, that are blackish and reddish, are opaque. The talky spangles are brown and black, for there are none that are white. It will not ferment with aqua fortis, and in the fire it turns to a deeper red. It is found on the shores of the islands in the northern parts of the world.

The Fine Brownish Red Variegated GRIT with heterogeneous particles, is not so glittering as the former, but it is very fine, heavy, and of a faint brownish red, variegated with white, black and yellow. The particles are all bright and shining, and much of the same size. It is sharp to the touch, and in water subsides but slowly; however it leaves it clear. The particles when viewed through a microscope appear to be of irregular shape, some of which seem to be spar, and are semi-transparent, and are whitish, reddish, or brownish; others are crystalline without colour, though some are reddish or brownish and very bright, and others opaque and stony, and of a blackish or reddish colour. These with the talky flakes make a very agreeable appearance, for they are of different colours, as white, yellow, white and black. It ferments a little with aqua fortis, but undergoes no change in the fire. It is common on the shores of islands in the northern parts of the world.

The Fine Flesh-coloured Variegated GRIT with heterogeneous particles, is not so beautiful as any of the

the former, though it is very fine, pretty heavy, of a bright flesh-colour, and very glittering. The particles are all nearly of the same size, and there is little variegation of white and black. It is sharp to the touch, and subsides immediately in water, leaving it clear. When viewed through a microscope the particles appear to be of very irregular shapes, and some are white, others reddish, and others without any colour at all. They are not all equally transparent, but the greatest part of them are very bright, and there is a mixture of flaky spangles of talc, of white, brown, and black colours, with a few blackish stony particles. It will not ferment with aqua fortis, but it burns to a paler colour. It is common on the shores of the islands in the northern parts of the world.

The extremely Pale Whitish Red Variegated GRIT with heterogeneous particles, is not so finely coloured as some of the former; but it is extremely fine, very heavy, and of a pale whitish flesh-colour. It is variegated with many black spangles, and the particles are all very bright and glittering, and are nearly of the same size. The talky spangles are black, and remarkably thin. It is sharp to the touch; and though it subsides slowly in water, it leaves it very clear. When viewed through a microscope all the particles appear to be transparent, except a few that are black. It will not ferment with aqua fortis, but the fire turns it to a grey colour. This likewise is common on the shores of islands in the northern parts of the world.

The Brownish Red Coarse Stony GRIT, with heterogeneous particles, is considerably heavy, and of a fine pale flesh-colour, variegated with brown, and there are a few glittering plates of white talc. The particles are regular with regard to their size, and pretty bright and shining, which render the whole mass very glittering. It is sharp and harsh to the touch, and subsides immediately in water, leaving a little muddiness therein. Through a microscope the particles appear of different shapes, but most of them are flattish and bright, though not very transparent. Some are of different degrees of flesh-colour, others

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of no colour at all, and there are also brown particles that are more transparent than the rest. There are a few spangles of white talc, which are very thin, and smaller than the other particles. It will not ferment with aqua fortis, and it burns to a little pale red. It is met with on the shores of *Red Sea*.

The very Coarse Shining Blackish Flesh-coloured GRIT with heterogeneous particles, is remarkably heavy and of a mixed colour, between pale red and black, and the particles are bright and shining, besides which there are a few black flakes of talc, but not so large as the other particles, though they are of different sizes. They are very hard to the touch, and subside immediately in water, leaving it clear. Through a microscope the particles appear of various colours, shapes and sizes, for some are white, others of a pale red, and a great number are black, and though they are not transparent they shine more than the rest. The flakes of talc before taken notice of are partly white and partly black. It will not ferment with aqua fortis, nor does it undergo any change in the fire. It is found on the shores of the islands of *Sicily*.

The very Coarse Shining Reddish Green Stony GRIT with heterogeneous particles, is considerably heavy, and of a reddish green, or rather of a greenish red. The particles are partly green and partly red, intermixed with many that are white; and they all together are bright and sparkling, and there are a few spangles of greenish white talc. All the particles are nearly of the same size, and are very hard and sharp to the touch; they subside immediately in water, leaving a reddish muddiness therein. It is found on the shores of the *Mediterranean sea*.

The CHRYSOCOLLA of the ancients is a coarse beautiful green, though dull Grit. *Geoffroy* observes that it is of two kinds, the natural and the facitious. The natural is found in copper mines, and sometimes in those of different kinds, but then he supposes there is copper therein. Sometimes it is found alone like sand, and is entirely of a green colour, and often of the deep colour of a leek, which is thought to be the best.

best. There is some of a lighter colour, which is not at all esteemed; and there is a third of a colour between both. It is cleaned by washing, after pounding it in a mortar, and pouring water thereon; when it is settled it is to be strained off, and then it must be ground with more water; and this must be repeated till it appears to be quite clear and pure. Then it is to be dried in the sun and laid up for use. If it is required to be still finer, it must be bruised, and then calcined afterwards, washing it as before. The factitious Chrysocola is taken notice of by *Pliny*, and it is only the native, which has been bruised, calcined, and reduced to a very fine powder; then steeped in vinegar, pounded again, washed in shells and dried; afterwards it was tinged with the alum called *Schistos*, and a yellow herb, whence it was called Herbaceous Chrysocola. There is also another factitious Chrysocola mentioned by *Pliny*, who affirms it was called *Santerna*, and acquaints us that it was made of *Cyprian* verdigrease, with boys urine, and the addition of nitre, and afterwards ground in *Cyprian* mortars. *Galen*, who followed *Dioscorides*, takes no notice of the nitre, and only advises to have it prepared in the summer time, or at least when the air is hot. The urine was to be rubbed in a mortar for several days, till it became as thick as honey. The Chrysocola now under consideration is somewhat coarse, moderately heavy, and of an exceeding lively and agreeable green, with very uniform particles, which are nearly of the same size, but of little brightness. It is not very harsh to the touch, and it subsides immediately in water, leaving it quite clear. Through a microscope the particles appear to be pure, and in angular figures, generally approaching to a rhomboidal form. It ferments strongly with aqua fortis, and tinges it with a blueish green. It is found on the shores of *New England*, and is taken to be green sand; it has also been brought from the shores of the *Red Sea*. It is used by goldsmiths for the soldering gold, and by painters, and that is looked upon to be the best that comes nearest the colour of an emerald.

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The Fine Shining Pale Green GRIT is very heavy, and of a beautiful pale green, variegated with white, and it is very bright and shining, the particles are regular in their size, and it is harsh and sharp to the touch; it subsides immediately in water, leaving it entirely clear. It is found upon the shores of the *Red Sea*.

The Shining Gold-coloured GRIT with heterogeneous particles, is light in comparison of many others, and is of a fine bright glittering gold colour, being principally composed of flakes of yellow talc, for the harder particles are very few. The flakes are of different sizes, and it is softer to the touch than any other kind; it subsides slowly in water, leaves a whitish yellow muddiness therein. Through a microscope the stony particles appear to be reddish, whitish, and seemingly transparent. It will not ferment with aqua fortis. It is found in *Virginia, Germany, France* and *England*.

The very Hard Fine Black GRIT variegated with white, is the hardest, heaviest, and brightest of all the Grits, and is of a fine jet black colour, with a few specks of white. It consists of particles nearly of the same size, and is exceeding hard to the touch; it subsides immediately in water, and leaves it entirely clear. Through a microscope the particles appear to be all angular, of which some are whitish, and others greyish, but both are very transparent; yet those of a jet black, which are most numerous, are entirely opaque. It will not ferment with aqua fortis. It is met with in *France*.

The Fine Black and White GRIT with heterogeneous particles is pretty heavy, and the principal particles are bright and shining, but they are rendered more so by the mixture of fine white flakes of talc; it is harsh and sharp to the touch, and subsides very soon in water, leaving it quite clear. Through a microscope the black particles appear to be opaque, and there are a great many transparent and without any colour, and exceeding bright; the flakes of talc are also transparent. It will not ferment with aqua fortis, and

and it is brought from the shores of the *Mediterranean* sea.

The very Coarse Black and White GRIT with heterogeneous particles is extremely heavy, and its particles seem to be all nearly of the same size; the greatest part seem to be coarse and dull, but there are a few that are bright; however the quantity of talc makes it glitter pretty much, for they are white and glossy. It is rough to the touch, and subsides immediately in water, leaving it very clear. Through a microscope it seems to consist of a great number of white semi-transparent particles, of which there are some as transparent as crystal, and very bright, besides many of coarse white talc, and a great many others that are black and opaque. It will not ferment with aqua fortis, and when burnt it is of a flesh-colour, with black and white spots. It is found in *Wales*.

The Shining GRIT of a rusty black colour, with heterogeneous particles, is considerably fine and heavy, but entirely dull of itself, though the great number of black flat shining particles make it shine very much. It is harsh and rough to the touch, and settles immediately in water, leaving it entirely clear. Through a microscope it appears to consist of different particles, and those without colour, as well as the yellowish and reddish, are like small pebbles; these are bright and pretty transparent, besides which there are many others of uncertain shapes, and quite opaque; these seem to be fragments of stones of different kinds; and there are a great many that are dusky, with somewhat of a reddish colour, supposed to be pieces of iron ore. Besides these there are multitudes of spangles of different shapes and sizes, which are all very bright, and are taken for fragments of lead ore. It will not ferment with aqua fortis, and in the fire it becomes blacker, and it is known in *England* by the name of black writing sand.

The Coarse Sparkling Brownish Black GRIT is much like the former, but it is more coarse and remarkably heavy. It owes its sparkling to flat shining particles like the former, though they are not so many in number; it is very sharp to the touch, and subsides

in water immediately, leaving a little blackness therein. Through a microscope the particles appear to be various, of different shapes and figures, but nearly of the same size. They are partly fragments of stone, and partly iron and lead ores; but they are not so bright as in the former, they having smaller surfaces. The iron ore is discovered by means of a load-stone, as likewise in the former. It is common on the shores of *Wales*, and serves for the same purpose as the former.

The Fine Brownish Black Sparkling GRIT is pretty fine, and remarkably heavy, with an agreeable blueish black bright colour. The particles are of various shapes and sizes, and it is pretty harsh to the touch; it subsides immediately in water, and leaves it quite clear. Through a microscope the particles appear to be of various colours, for some are reddish, some greenish, and others blackish, mixed among a vast number of particles of various sizes and shapes, but all of a blueish black, with glossy surfaces. It ferments slightly with aqua fortis, which is probably owing to the sparry matter contained therein. It is common on the shores of *Wales*.

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C H A P. XXXIII.

Of MARCHASITES and PYRITES, or FIRE STONES.

THE generality of Authors think Marchasites and Pyrites to be the same substance, and others distinguish them, making two different species thereof. *Boet* observes, there are several kinds of Pyrites, and that all stones that strike fire properly deserve that name. Some are bright like silver, others consist of several coats, others are like dice. Some are like red marble, and shine with a metalline splendor, others are purple, quadrangular and transparent, and others again are spongy and shining or pumiceous. Some have eight angles, others have twelve, others are like bismuth,

bismuth, and others again are tinged with a gold-colour, from whence they take the name of Marchasites. Some are of a copper-colour, whence they are called Kupferies by the *Germans*, others are of various colours and forms, and others are mixed with stones. Among these, some will melt in the fire, and are added to metals instead of lead, to render them more fusible, whence they are named by the *Germans* Flußtreinen, and when they are broken they shine like sugar-candy. He adds to this, that there are stones called Pyrites, which will not strike fire with steel, and these he thinks ought not to be placed in that class. Among the Marchasites so called by some there are

The Silver-coloured MARCHASITE, which is of a very firm and compact texture, is remarkably heavy. It is found making strata of itself, which though very broad are thin, being from three inches to a foot in thickness. Sometimes there are pieces found by themselves, and in general they have a very irregular and unequal surface, they being made up of great numbers of irregular flakes, and of various sizes; they being bent, undulated, and sometimes infold each other. However, these plates are not at all distinguishable by the naked eye, but seem to constitute one solid mass. The colour resembles that of silver, but is more glittering. It readily strikes fire with steel, but will not ferment with aqua fortis; and when put into the fire it cracks and breaks, emitting a blue flame with the smell of brimstone. After it has burnt a considerable time it turns to a deep red. Sometimes this Marchasite is mixed with lead ore, sometimes with that of tin, and very often a dusky brown ferruginous substance. It is found in great plenty in lead and tin mines.

The gold-coloured MARCHASITE is more glittering than the former, but not so compact, though it is pretty heavy. It is commonly found in thin strata, and sometimes in pieces. It seems to be composed of a congeries of flat flakes, not unlike great numbers of irregular fragments of leaf gold, placed together without the least order. However, some parts of this Marchasite are more loose and open than others, though

though it is all in its natural shape of a deep yellow gold colour; however it is sometimes paler, and sometimes deeper, and at other times will reflect all the colours of the rainbow. It will not strike fire with steel so readily as the former, nor will it ferment with aqua fortis. When thrown into the fire it will slowly emit a blue flame from all parts of its surface, and will burn to a very deep substance. It is plenty in *Germany*, particularly in *Hartz* forest, and has been met with in *England*, but not so often as the former.

Heavy white MARCHASITE is very firm and solid, and more heavy than the other two. It is often found in strata by itself, and sometimes in detached pieces; but it is more commonly met with in the cavities of other strata, of the breadth of several yards. It has a smoother surface than the others, and is more uniform in its composition, though if it be carefully examined it seems to consist of undulated flakes laid closely upon each other. It strikes fire with steel, and it will not ferment with aqua fortis, and when put into the fire it burns pretty briskly, emitting a blue flame, with the smell of brimstone. It is found in *Devonshire*, *Cornwall*, and some other counties. These are all the Marchasites properly so called, taken notice of by authors.

The Flat Pyrites or FIRE-STONE with a rough coat, can hardly be distinguished from other Stones by its external appearance. It is pretty firm and hard, as well as heavy, and is of no certain size, being found from one inch to ten in diameter. It is always flat and thin, and has very unequal and irregular edges. When it is about four inches long, it is half an inch thick, and requires a strong blow to break it in pieces. When broken its texture seems to be regular and uniform, and consisting of one homogeneous mass, of a dusky brownish green colour, surrounded with a coat of a dusky ferruginous substance, which is rough and beset with small pebbles of different shapes and sizes, though generally no bigger than grains of sand. It is always of the colour of rusty iron, and is thicker in some than in others. It will strike fire with steel, but not ferment with aqua fortis; and in the fire it emits

emits a blue flame which soon goes out, and when sufficiently burnt it turns to a deep purple. It is found in gravel-pits all over the kingdom.

The Round PYRITES with a cracked coat is coarser than the former, it being composed of visible grit. It is very heavy, and is of various sizes, from half an inch to twelve in diameter, and requires a strong blow to break it. The colour is pale, with a mixture of dull whitish green, and a dusky brownish cloud. The outer coat or crust is of a brownish yellow, and of different thickness; the surface is divided by shallow cracks, and after it has been for some time in the air, they become deeper. It readily strikes fire with steel, and in the fire emits a strong blue flame, and last of all calcines to a purple powder. It is common in the chalk-pits of *Kent*, and many other places.

The Flat PYRITES with a very thick whitish brown crust, is extremely hard and firm, though moderately heavy. It is commonly flat and round, or oval, and its usual size is two inches and a half in length, two in breadth, and one in depth. The surface is rough, it being full of small tubercles, and it has the look of a lump of brownish clay; but it requires a smart blow to break it, and when broken, a nucleus is found of the same shape with the whole stone. This is very compact, firm, and hard, and of a deep dusky green. The nucleus will strike fire with steel, and burns to a red; but the crust itself turns to a pale brick colour. It is found in a clay-pit near the end of *Gray's-Inn-lane*, and very probably in many other places.

The Green PYRITES without a crust is met with in a great variety of different shapes. It is of a hard firm close texture, and very heavy, and is found from half an inch to ten inches and upwards in length. Sometimes it is in the shape of a common pebble, but it is more generally flat, with an uneven undulated surface, and seems to consist of many plates laid one upon another. It is extremely hard before it has been exposed long to the air, and is of the same colour both within and without, that is, of a pale silvery green. It readily strikes fire with steel, but will not ferment
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with aqua fortis; and it readily cracks and breaks in the fire, emitting a fine deep blue flame, and turning at last to a florid red. It is very common in all parts of *England*, particularly in the strata of blue clay.

The PYRITES resembling a bunch of grapes without a coat is of a firm hard structure, and remarkably heavy. It is commonly small, and of a longish form, though sometimes round, and many pounds in weight. It is most commonly without ever a crust, and requires a strong blow to break it. When broken it appears to be a kind of a metallic body. It is most commonly of a very pale green, though sometimes deeper, and the surface is always covered with tubercles of various sizes, so as to have a distant resemblance of a bunch of grapes. It strikes fire readily with steel, emits a blue flame in the fire, and soon falls to pieces; but it at length turns to a beautiful purple. It is common in many parts of *England*, and when it has been long exposed to the air it has often a thin coat of a rusty colour.

The Round PYRITES with a streaked structure, and an irregular surface, is very heavy, and is usually found in a roundish shape. The general size is from four to six ounces in weight, though there are some of two or three pounds. The surface is irregular, and sometimes beset with flattish tubercles, and sometimes raised in ridges on account of their being placed in distinct rows, which meet in various angles. It is pretty hard, and when broken appears to be of a streaked texture, and the streaks run from the centre to the circumference. It is of a whitish green within, is covered with a brown crust, and is very bright and glittering when just broken. It strikes fire with steel, and burns to a purple powder. It is common in chalk-pits.

The Round PYRITES with angular tubercles is remarkably heavy, and is found from an ounce to a pound or upwards in weight. It is generally roundish, and the surface is remarkably rough, insomuch that Dr. *Woodward* calls it the echinated or prickly Pyrites; however, the tubercles are not sharp pointed. It is of a rusty colour, and is covered over with short
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quadrangular pyramids, which are broad at their basis, and blunt at their points, commonly standing very upright and close to each other. It cannot be broken without a strong blow; but when it is in pieces are found to be streaked, and of a greenish colour, with some small mixture of yellow. It strikes fire with steel, and will flame soon in the fire, with the smell of brimstone, and bursts to pieces; after which it calcines to a fine deep purple. It is common in *England* in the strata of chalk.

The Silver-coloured Round PYRITES with a smooth surface, is of a pretty firm texture, and remarkably heavy. It is commonly round, and the usual size is about an inch and a half in diameter; but it is sometimes met with to the weight of two pounds. It is always without tubercles and ridges, and the surface is of the same colour as the inside, though not quite so bright. It breaks with a small blow, and when broken appears to be of a streaked texture, and of a beautiful silvery green colour; and the streaks run from the centre to the circumference. It strikes fire with steel, and in the fire it emits a blue flame, with a strong smell of brimstone, after which it bursts and calcines to a deep purple powder.

The PYRITES with a foliaceous surface is of a very firm but uneven texture, but very heavy, it is of various shapes, but commonly round. It is of various sizes, but generally large, though those of six or eight inches are commonly round. It is harder than most other stones of this kind, and when broken appears to be of a streaked texture, and the extremities of the surface are seen in rows of thin leafy plates, of unequal plates which cover the whole. They generally lean one way, but they are of unequal thicknesses, and sometimes notched at the end. The colour is of a dusky green, which when just broken is very bright and glittering. It sometimes consists of a homogeneous substance; but most commonly there is only a thick crust of the true Pyrites surrounding a substance of a different kind. In the fire it emits a deep blue flame and bursts, after which it calcines to a purple powder. It is found at *Goslar* in *Saxony*,
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and in *Hartz* forest, and sometimes in *England*, particularly *Mendip* hills, *Derbysbire*, and *Cornwall*.

The PYRITES with a smooth glossy surface, is of a very firm coarse regular substance, and remarkably heavy. It is of a very particular shape, being always more or less hollow; and in various forms, often like pebbles, but more particularly rugged and knobby. The common size is five or six inches in diameter, and the surface is so glossy, that even the tubercles thereon appear to be so. It is very hard, and when broken appears to be streaked with irregular cavities, and the streaks are more narrow than in other stones of this kind. On the inside they commonly terminate in broad plates, nearly of a square figure, and are disposed in rows. The general colour is greenish, but if it is broken where these plates are, it is commonly of a bright beautiful yellow. It emits a blue flame like the rest, and calcines to a fine red.

The Large Foliaceous PYRITES in the shape of a cube, is of so regular a figure, that it has by many been thought to have been the effect of art. It is of a firm regular structure, and very heavy, and it is commonly found about one third of an inch in diameter. All sides are perfectly smooth, and it breaks in all directions, for it consists of plates in the direction of all the surface. It is glossy on the inside when just broken, and seems to be composed of plates like talc. It is of a fine whitish green colour, with a small mixture of yellow. In the fire it emits a deep blue flame, with a strong smell of brimstone, and calcines to a deep purple. It is found in *Germany*, *Hungary*, and the *East Indies*.

The Small Solid PYRITES in the shape of a cube, is not unlike the former, it being firm and hard, and very heavy. The shape is regular, and the size is commonly about an eighth of an inch in diameter. It is perfectly smooth on every side, and when broken is very bright and glossy. Its colour is commonly of a pale yellowish green, though in those that are large it is somewhat of a rust colour. It cracks and burits in the fire, emitting a deep blue flame, and at last calcines to a fine red. It is common in the north parts
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of *England*, and many other countries. It is here found in common black slate, but in *Germany* about the earth on the mountains.

The Bright PYRITES with eight sides is very firm and compact, of a pretty even texture, and very heavy. It is always composed of eight triangular planes, though it is subject to some varieties. Its most perfect shape is when two pyramids are placed evenly one against the other; but they are more commonly set uneven and slanting, and their planes are very irregular with regard to their size. It is from the bigness of a large pin-head to that of a walnut; and they are naturally smooth, and of the colour of polished iron. When broken the pieces appear very bright and sparkling, and often much paler than the outer surface. They seem to be composed of irregular thin undulated plates, laid more closely together than in the marchasites. In the fire it cracks and bursts, emitting a blue flame, with the smell of brimstone, and at last calcines to a deep purple. It is found in *Cornwall*, and is very common in *North America*.

The Hard Shining PYRITES with twelve sides, when perfect, is extremely beautiful, but is seldom met with in that state. It is pretty hard, and of a regular texture, and very heavy. It is subject to great irregularities, but it often wants one or more of its sides, and has commonly other bodies of its own substance sticking fast to it. It is of various sizes, it being from one inch to four in diameter; but it is more frequently about the third part of an inch. The surface is smooth and shining, and generally of a pale yellow, and sometimes it is of the colour of rusty iron, and sometimes of polished steel. When broken it appears to be of a foliaceous substance, and to consist of very thin plates irregularly placed, and may often be distinguished by the naked eye. In the fire it emits a blue flame, with the smell of brimstone, and calcines to a blueish purple. It is found in *Cornwall*, but is more common in *Germany*, as well as in the *East* and *West Indies*. It is observable that all these kinds of stones strike fire with steel, and will not ferment with aqua fortis. The use that some of these are
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of in making green copperas has been already taken
notice of in its proper place; besides which they get
sulphur out of them in many parts of *Germany*.



C H A P. XXXIV.

Of FOSSILE PETRIFIED BODIES.

BEFORE we come to particulars it will not be
improper to take notice of petrifications in general,
some of which are performed as it were within our
sight, and therefore are most easy to be understood.
The first of which is the stalactites, which is a kind of
cylinder formed on the roofs of some caves and grottos,
which has been already taken notice of in its proper
place. This is evidently brought to pass by means
of the water which carries with it very fine sand, that
by length of time increases to different sizes, and forms
the different layers which are successively produced
one over another.

Another kind of petrification which is well known,
are the crusts of stone which the water of some springs
fixes by little and little to the pipe through which it
passes, for these are almost every where to be seen.
From these it plainly appears, that the matter of the
petrifications, let their nature be what they will, is
driven by water to the sides of the pipe in small particles,
which being applied to each other without any
regularity, forces the water itself to turn from the
centre of its course, to make a passage for itself; because
the stony matter is applied as it were by chance.

Another sort of petrification also very well known are
the pieces of wood, shells, and other substances, that
are petrified in the bowels of the earth, or in springs,
without losing their shape, or distinguishing marks by
which they are commonly known. These may be distinguished
into three kinds; that made in plates or layers, that done
by pellets or balls, and that by penetration.

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The substances by which these are brought about, are water, salt, oily juice, sand, mud, and clay. The water seldom penetrates the substance of stones to no purpose, but carries with it and mixes the materials of which they are composed; much in the same manner as the masons make use of water wherewith to blend and intimately unite the materials of which they make mortar or cement, that grows hard in proportion as the water flies off. All sorts of walls are composed of hard masses and cement, for the cement alone would of itself be of little use; however, it cannot be denied that in some parts of the world they make walls of mortar alone, particularly in *Morocco*, where they throw their mortar into wooden cases, and let it remain till it grows hard; and then they do the same still higher and higher, till at length they make a wall of the height they design. However, this is not the case with us, for here mortar is made use of only to fill up the void places between the stones and bricks, and to keep them fixed where they ought to stand; for by insinuating itself into the pores of the stones or bricks, it makes one mass of the whole; insomuch that when the mortar is quite dry, the wall becomes solid, and cannot easily be shaken.

It is just the same in the three kinds of petrifications, for the water contains small quantities of exceeding fine cement, which are generally particles of sand, clay, or mud. The strongest cement consists of salts and different bitumens: sometimes the salts and clay serve as a cement for sands; and sometimes it is the clay alone, or mud, that constitutes the mass. From the different degrees and quantities of the different mixtures, a prodigious number of different substances may be produced; but it is the water that brings them together, by taking them up in its course, and mixing them one with another, depositing them in the passages through which they run. After the water is gone they have time to harden and dry, because their particles being intimately blended together, can have no means of separating again.

To the first kind of petrification we may refer talcs, slates, plumous alum, and plaster. As for crystal, it

is nothing but a heap of sand, perhaps in a pyramidal or triangular shape, which the water applies successively one upon another, uniting them together with a little salt, and very fine mud ; this is the more probable, because when crystal is decomposed in the fire, there remains nothing but calcined sand, earth, and a little salt. We need not wonder that crystal should be thus formed into a transparent mass, because several sorts of white sand viewed through a microscope appear to be nothing else but true white crystal. The earth or mud that is joined thereto only hinders them from shining like a diamond.

It is easy to imagine that a fall of water may bring into any place a layer of sand and blackish earth, and that a second may throw another upon the former, and so on ; infomuch that in length of time slate may be produced of different thickneses. In the same manner different substances may form talc, plumous alum, and plaster.

Indeed it is hard to conceive how plumous alum or amianthus can be so formed, because it will resist the fire ; however, it is well known that clay is little affected by fire ; and yet it is still hard to conceive with what it can be united, so as to form threads on which the fire will have little or no effect. But with regard to plaster of *Paris*, the explanation is more easy, because sand seems to be the predominant substance therein, and is united to a certain portion of mud or clay ; for this stone being slightly boiled will dissolve, and let the clay fall in the form of powder. When this plaster is thus dissolved, it will soon grow hard again, by pouring a little water upon it, and stirring it about ; because the particles of the clay are like so many fine sponges, which immediately suck up the small quantity of water poured therein, which swelling fill up exactly all the interstices of the sand, and so unite them together, and by this means the water entirely disappears ; or if any moisture remains when it is evaporated, the spongy particles will retain their form, like so many pipes, and keep their position when the water is gone.

The second sort of petrification is that which is performed by small pellets or balls, and often by bunches composed thereof. It is probably by this means that gems receive their formation, because many of them are found in the chinks and cavities of certain rocks, where the water can bring nothing with it but sand, salts, and a little bitumen, and by chance some metalline particles. These small congestions of matter, coming to sink and harden by degrees, may carry along with them the very fine particles they meet with. The generation of irregular flints, and all other stones that will strike fire with steel, seems to be the same as that of gems; for the water meeting in its course certain cavities more or less wide in marl, chalk or clay, that are in rocks, there deposits the salts, the oily fluids, and the fine sand with which it is imbuted. This water afterwards evaporating, the sand, and every thing that is introduced within the cavity, becomes hard as in a mould, and forms a mass which takes the same figure. When fine sand is the principal ingredient, the concretion is more or less transparent and hard, as are all sorts of gems. The colours are dull, variegated, or marbled with veins, in proportion to the different mixtures of the substance of which they are formed. When there is a great deal of salt or sulphur, which are well known to contain particles that strike the nose and yield fire, then the stone will have a strong smell of sulphur when it is broken or struck, and will sparkle when it meets the blows of another stone as hard as itself, or when it is struck with the steel or hammer, that by its extraordinary hardness discomposes the pores wherein the particles of fire are lodged. These sorts of stones very evidently contain a great deal of fire, and therefore they might be supposed by some to be electrical, and yet it is plain they have no such quality, which may be owing to the earthy particles in which the fire lies hid, and which may prevent the effects of rubbing, in the same manner as a lock of wool placed against a glass, or when tied to the string of a musical instrument, prevents the vibrations, and consequently the sound.

There are a great many flints and flinty stones that are exactly round or oval, or approaching thereto, and of all sizes, which seem to be composed of, or form small pellets or plates, by means of a nucleus which is the basis of the whole. When the water is loaded with a small bit of marl or some small stone, as it repasses through this small mass, it will fill up its pores or inequalities with the clay or other particles contained therein, and it will bestow upon it a smooth and pretty regular surface. If this is repeated several times by the application of the water to the mass, it will always leave a small layer or coat of sand before it flies off. These circular layers or coats growing hard by the evaporation of the water, will form a small arch, which will grow still stronger and stronger, by the successive application of several other layers or coats. The whole will grow more thick in proportion to the number of times that the water returns, and deposits fresh matter. It may so happen that the nucleus of chalk, marl, stone, or clay, which has been as it were the foundation of the first arch, being rendered hot by some external means, that is not now necessary to explain, all the moisture will evaporate and diminish the size. By these means it may often come to pass that there may be a nucleus in the middle of the stone, as we often find by experience; which may be sometimes chalk, sometimes common earth, or other substance quite different from that of the stone; so that at length by shaking the stone it may be easily found by the rattling, that some substance is contained therein. Thus the formation of round and oval stones becomes much the same as that of certain stones which are known by the name of Bezoars, and which are found in the bellies of several animals, both in the *East* and *West Indies*, and to which great virtues are attributed.

Some of these stones, that have a cavity in the middle, often contain a hard substance, or another stone, which may be easily known from the noise it makes when shaken; and this is commonly called by the name of the Eagle Stone, to which most extraordinary qualities have falsely been attributed.

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The third manner of petrification is what is called by some penetration, and this is the most common; thus a large bed of sand, clay, or other matter, may be petrified by the salts and other particles wherewith the water is imbued when it sinks therein. The water will carry with it all the fine salts it has dissolved and taken up by the way, as well as the exceeding fine earthy particles which have remained therein. This water will readily pass, as well as every thing it contains, through a bed of sand, that is too full of pores to stop it; but it will fill by degrees all the interstices of more compact sand, and will closely unite all the particles; and by this means we may understand the formation of what we commonly call free-stone. A bed of earth or of sand will be changed into a stone more or less hard in proportion to the quantity of clay or sand contained therein. Marl and potters clay thus mixed with sand will be changed into marble, whose ground may be either red, green, or black, according to the nature of the petrified bed. Perhaps the ground of any marble may be nothing but very fine sand, into which the water has penetrated, and carried at many thousand different times the fine particles of marl and potters clay, and which in process of time may obtain the hardness in which they are found; and consequently their natures, colours, mixtures, and clouds, may vary to infinity. If the potters clay has been dried and cracked by some subterranean heat, the fine sand, or marl, or other substances which are carried by the water, and deposited in the chinks or cracks, may produce veins of all colours, and of all shapes. Likewise when there are particles of gold, or any other metal, that are fine enough to be dragged along by the water, they may serve to augment the richness of these variegations. The drops of oily fluids that the water carries along with it, may expand and form a multitude of small spots, which may be round when they are at liberty, or oval when they are a little confined on each side; or in short they may be angular, or of any other shape, according to the impediments they meet with. All the winding veins on the sides of which we sometimes

fee rows of small specks of gold, or other metals, extremely fine, serve to shew very evidently the progress that the water has made; for when it happens to be stopped, and obliged to turn, it penetrates wherever it can, and so produces very irregular variations. The particles which the water contains, being naturally a little more heavy than itself, must needs be deposited in time, and stopping by the way, must penetrate the very first cracks or other cavities that they meet with. We may compare the formation of a marble, or other stone, to that of cloth or tapestry; for the body of the sand or clay, which is capable of penetration by water, may be compared to that which weavers call the warp, and the water to the shuttle, which passes across the other without stopping. The fine sand, the particles of common clay, the colours of potters clay, the fine threads or small leaves of metallic substances, may all together be compared to the woof which is introduced into the body of the work, and which fills it by little and little.

However, it sometimes happens that there are thin plates or layers of clay between the different beds or strata of stone, and which are free from any mixture at all; from whence it appears that they have hindered the progress of the water, for they only served to sustain, and could not be penetrated by it. Perhaps it may be thought a wonder why there should be any stratum of stone or marble under this clay, since the water could not get through it; but this will soon cease, when we consider that many parts of the clay may be very thin and full of cracks, and consequently will admit the water to pass very freely through it. All the water with its contents may run over the clay, and may be shed at the extremity of this layer, into the bed which lies beneath; and it has been found by experience, that many rocks of an enormous size will not prevent the water from passing thro' their bowels, and falling into beds of sand that are placed underneath.

That which the water performs by the penetration of the different strata contained in the earth, it brings about in some degree with regard to pieces of wood, bones,

bones, and other substances which it enters into; and which affords us a reason or method of explanation of all the different petrifications, though never so odd, which are to be met with in all parts of the world. We cannot determine whether there has ever been a universal earthquake or not, which has changed its primitive form; or whether the accidental shocks of comets may have produced the alterations which evidently appear therein; for we find several sorts of animals, and sometimes mankind, in small islands at a vast distance from the main land, which can hardly be accounted for, but from some extraordinary cause, that has produced great irregularities in the face of the earth, making that to be a sea which was dry land before, and raising up mountains out of the bosom of the deep; especially since we find from some such change, that there are a vast number of marine bodies at a great distance from the sea, and a great deal higher than its surface. However, this is certain, that a great many substances which seem to have been proper only to the sea, are now found in the bowels of the earth; and which have perhaps been petrified by degrees, by the insinuation of water, salts, and exceeding small crystalline or stony particles, proper to fill up their pores, without alteration of their shape. To this all the productions which some have looked upon as *lusus naturæ*, or sports of nature, are evidently owing. Besides the bones of crocodiles, the skeletons of sea horses, the entire bodies of petrified fish, there are almost every where found sea shells of all kinds, and all sorts of the parts of sea animals, converted into stone. Some are very wonderful with regard to their situation, and others with regard to the oddness of their shapes. However, some are of opinion that if these changes have been in reality produced by earthquakes, it will not from thence follow we should find them converted into stone; but this may be easily accounted for, if we reflect a little on what has just been said; for their situation is no harder to be comprehended than that of flints, which are generated in the middle of other substances; for though they undoubtedly were in their natural state before the alterations were

made, yet it is easy to conceive in what manner they have been petrified since that time. These petrifications have had different names bestowed upon them by naturalists, and therefore it will be necessary to give a more distinct account thereof. They are principally of two kinds, that is, animal and vegetable substances; some of which have remained in the earth a vast number of years without any great alteration, and others have been covered with or turned into stone; however, they all come under the denomination of Fossils.

With regard to trees, there have many been found buried under ground in many parts of the world, and particularly in *England*; as on the coast of *Suffolk* near *Dunwich*, in the fens of *Lincolnshire* and *Yorkshire*, and more particularly in the Isle of *Axholm*, which is made by rivers, and lies between *Nottinghamshire*, *Lincolnshire*, and *Yorkshire*; as also on the coast of *Pembrokeshire* in *Wales*. These have not only been found near the sea, but in inland countries at the depth of ten or twenty ells; and *Boet* tells us there have been whole woods of trees, with their trunks, boughs and leaves so distinctly appearing thereon, that it might be readily discovered what sort of trees they were. We are also told by another author, that in the territory of *Peland* near *Boisleduc*, in the province of *Brabant*, there are the like. *Wermius* asserts, that there are many of these in the highest and most craggy mountains of *Iceland*, where no one dares venture to go but such as have been trained up to climb precipices from their youth, and where they must dig to the depth of some ells before they can come at them.

In *England* likewise there are some that lie at a distance from the sea, as in *Chatmoor* in *Lancashire*, several parts of *Yorkshire* and *Cheshire*, as well as in *Staffordshire*. The places in this last county where they are found are *Laynton*, and the old *Perwit Pool* in the parish of *Norbury*; *Shebben Pool* in the parish of *High Offley*; the moor near *Eardley*, in the parish of *Audley*, and near the town of *Butley*; all which lie in the high country of the moor lands. They are found still farther from the sea in *Cranmoor* near *Wrottesly*; in *Rotten Meadow* under *Wednesbury Hall*; on *Dorley Common* in the

the parish of *Gnosal*; in a place called *Peat-Moor*, and in the moors of *Handsworth*; none of which are less than thirty, and some are above fifty miles from the sea. Some will have these to have been originally formed in the earth, especially because they resemble firs, of which sort none ever grew naturally in *England*, if we may believe the account that *Cæsar* gives in his Commentaries. However, this appears plainly to be a mistake, because many of these trees have their roots still remaining, as well as the stumps of their branches. If there is any such thing in reality as fossile wood, it is generally allowed not to swim on the surface of the water; whereas all these before mentioned will: besides, they still retain the qualities of wood, and sometimes they are found swimming in pools, which the country people get out, cleave into splinters, and make use of them instead of candles. The chief difficulty lies in knowing whether firs ever grew in *England* or not; and some, to solve this, have pretended that they have been brought hither by some flood, particularly that of *Noah*, where they have lain ever since. It must be acknowledged, that there is no impossibility in this, or at least that they may have been brought hither by some such means; because they are full of a large quantity of bitumen, which no doubt would preserve them from corruption a vast number of years. However, this account is not very probable, because if they had been brought hither by a flood, they would have been found in all low places alike, and in the south of *England* as well as in the north; for there are none in the vales of *Evesham* or *Aylesbury*, nor indeed in many others, which seem to be most likely. Some of these trees appear as if they were burnt, and others have the marks of the ax still remaining upon them; besides, the stumps from which they were cut are in some places also remaining, and they appear in the same posture as when the tree was growing; particularly in *Shebben Pool*, when the summer is dry and the waters low. Others, with more probability, have thought that these trees were not fir, but birch or alder, because they delight to grow in moist places,

and having been soaked many years in a bituminous stuff, have been so well impregnated with an oily matter as to imitate firr both in smell and burning: however, this can hardly be the case, because they split exactly like firr, and because they have evidently a turpentine smell; and besides, at *Axholm* in *Lincolnshire* there have been found trees thirty-six yards long, exclusive of the tops, which lay very near the roots to which they belonged. But it would detain the reader too long, and be foreign to our present purpose, to endeavour to account for the manner in which these trees have been brought into this island.

Other trees besides firrs have been found to have been buried under ground; for Dr. *Moreton* takes notice of a small maple-tree that he met with in a stratum of clay at a considerable depth; and near *Bath* part of an elm-tree has been lately discovered of a considerable length: and no doubt there have been many others which have not been thought worth notice. But besides entire trees, or the principal parts, there have been commonly found in the fuel known in many parts of *England* by the name of Peat, and which is dug out of the earth, several fruits and catkins of other trees, that have been little altered in their texture. The most common of these are hazle-nuts; and near *Whitlesea* the twigs as well as leaves of white poplar have been seen, with the branches of hazle, and great numbers of the skeletons of leaves and catkins, besides the stones of plums or some such fruit. There have been some pretty large branches of trees found in the strata of stone, and commonly more or less changed into the nature of the strata in which they lay. A great variety of smaller branches have been found in the strata of blue clay which serves to make tiles in the neighbourhood of *London*; but though they were in their original shape, yet their internal structure was much altered; for they seem to be changed into the substance of the common vitriolic pyrites. These will fall in pieces when they are exposed to a moist air, and are of good use in making of copperas. These and others of the like kind are thought to have been branches of oak, and they are generally altered

in some sense to the nature of the strata in which they lie, by the insinuation of crystal or stony particles; but in some the veins of the wood are still preserved, and they appear very beautiful when polished. Some are entirely white, though not very hard; others of a brownish black, or quite black, which are much harder: in short they are almost of all colours, and of different weights and hardneesses, according to the adventitious particles contained therein. Some are so perfectly petrified as to strike fire with steel, as in one of the mines of *Hartz* forest; and the wood found in the *Loughneagh* in *Ireland* there is some of this sort, part of which has begun to petrify, and the other part is petrified entirely.

Dr. *Plott* takes notice of stones which he calls STELECHITES, whereof one in his time was met with near *Dudley*, called by the country people the Pox Stone, that is a stone which undergoes little alteration by fire. It was so much like petrified wood, that he took it for the stump of a tree at first sight. There are others of this name that are not so worthy of it, particularly the *Stelechites* of *Aldrovandus*, that has the appearance of antimony; whereof many are found in the rocks near *Beresford* and *Stanfop*, and among the rubble stones that lie loose above ground in the fields near *Heatley* and *Bagots-Bromley*. They are a sort of annular stones, regularly jointed and regularly streaked at the top and bottom; and therefore as unlike the trunk of a tree, though some of them are branched, as any thing can well be; nor indeed do they resemble the trunk or stem of any plant whatever. Mr. *Ray* takes them to be the petrified back or tail bones of fish, because they generally consist of several plates or pieces sticking together like the vertebræ of the backbones of some sorts of fish; though he acknowledges that they are shorter and thinner than the bones of any fish he had then seen. The thickest part of these seldom exceeds the eighth part of an inch, and some are not above a twenty-fourth part; though Dr. *Lister* tells us that he met with some about *Stock* in *Yorkshire* full a quarter of an inch thick. Many of these are perforated with a round, others with foliated or as-
fial

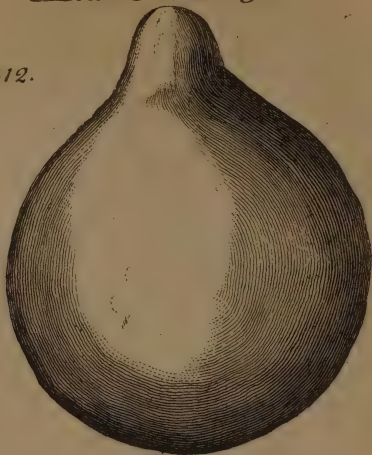
rial inlets of six or seven points. In former times they were put upon strings like beads, particularly by *St. Cuthbert*, from whence they were called *St. Cuthbert's beads*; but because they are full of small rays drawn from their perforated centre to the rim, they have been by some ranked among the *Trochites*.

Besides the trees and parts of trees there have been different kinds of plants which have undergone the same fate; and they have either been wrapped in the black slaty stone found over the strata of coals, or in loose stones of a ferruginous substance. Some sorts of stones contain the perfect images of plants, which seem to be nothing more than a painting, because the fluid contained in the plant has so intimately penetrated the substance of the stone, that it seems to be all of a piece with it, and has preserved nothing more than the figure. The plants that are thus found are of different kinds, but the most common are of the fern kind, yet not such as we have in *England*, for some pretend they are only to be met with in *America*. There are also a great number of sea mosses, with which many parts of the bottom of the sea are covered. An ear of barley has been found in one, or at least its image very exactly painted. *Jussieu* has found one in *France* which represented the foliage of the melancholy plant, so called because it always flowers by night. Some of the stones, when they have been split, have contained the figure only of the plant, while the other side has appeared more prominent; which seems to have been occasioned by the petrification of the plant itself. Some of the ferns thus found have been different from any species hitherto known; insomuch that it is hard to say, whether or not they were precedent to the chaos out of which the present globe of the earth was formed.

Though these impressions have been most commonly found in the slaty stones above mentioned, yet there have been other stones met with in which they have been seen, though perhaps not so commonly; particularly there is a whitish stone in *Germany*, not much harder than chalk, in which they have been frequently met with; as also a grey slate stone of a very fine texture,

MS. Natural History Museum for 1769. 16: 75

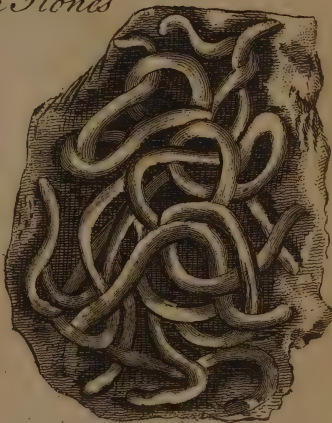
Pear Stone 312.



Olive Stone 312.



Worm Stones



texture, where they have been often found, besides one of a blackish blue colour. Not only the entire branches of plants appear in these stones, but sometimes the leaves of trees; particularly those of the poplar, willow, white thorn, pear-trees, and many others.

Perhaps it will not be improper to take notice of others that are less singular, and which are common in *Germany*. These are the leaves of oak and other trees which hang over springs whose waters have a petrifying quality, by whose means they are often covered with a crust like the mosses in many parts of *England*. The stone that covers them seems chiefly to consist of a sort of spar. Many specimens of all these kinds are frequently to be met with in the cabinets of the curious.

Dr. *Plott* has met with some sorts of these petrifications in *Oxfordshire*, particularly at *Samerton*, where the grass is covered with a soft stone, yet in such a manner that when it is broken off the grass appears as fresh and green as before it was incrusted. Some of the blades of grass grow at least to a foot in length, and yet when pulled up with the root, and held up by that part, it might be pulled out as entire as a sword out of the scabbard. At *North Aston*, in a field north-west of the church, there is another petrifying water, where the roots of rushes, grass, and moss are in a short time eaten away, insomuch that nothing remains afterwards except the figures of those plants, with some augmentation. In the parish of *St. Clement's* in the suburbs of *Oxford* there is a ditch, the water whereof covers with a crust the sticks that fall out of a hedge. At *Carfax*, in the city itself, there is a pump that not only covers the boards that fall into it with a crust, but also enters the very pores of the wood, which by degrees rotting away, there is nothing left at length but the lineaments of the wood itself.

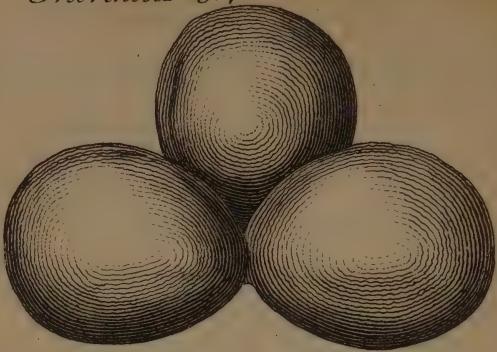
Petrifications of this kind are always very brittle; though they leave a faint representation of the grain of the wood, yet they never preserve its colour; and in the fire they are as incombustible as stone, for they
change

change nothing but their colour, which becomes more whitish: however, they will entirely dissolve in aqua fortis. There are some indeed that are petrified in a different manner, and will preserve both the colour and texture of the wood: they are sometimes so hard that they will cut glass, and they will always strike fire with steel.

The petrifications of marine substances are more common than those of any other sort; and among them are found fish of various kinds, more especially shell-fish, or rather the shells of those fish. However, it is not very common to find any which represent the figures of river fish; though Dr. *Plott* observed one that seemed to represent a carp, or a barbel; but it was more like the latter than the former, because the scales were thicker and shorter. It was found in a block of coal, and was broken into several pieces in taking it out. The petrified shells are so numerous, that large masses of them have been found together, particularly in *Virginia*. Some of these are composed only of cockles, not exceeding a pea in bigness, and streaked circularly to the hinges of the valves; yet none of them are hollow, but they stick closer to each other than to the bed of stone in which they lie. They are so solid that they will bear a very good polish; and they have been made use of for the floor of a chapel. There are some of this sort found near *Charlton* in *Oxfordshire*, that differ little from the former; in which the cockles are larger, but not so thick set. Another stone of this kind has the cockles in their full proportion, and some of them are beautifully crystallized. A moderate blow will loosen them from their beds; and many of them are either hollow, or filled up with a brittle spar.

There are other fossils called OSTRACOMORPHOS, which consist of heaps of oyster-shells cemented together. There are many other petrified shells that are not found in clusters, but each of them lie single in a separate state. Of these some are curiously streaked or furrowed, and others plain, with few or no ornaments. Of these again some are of a turbinated form, and others bivalvular joined together by a hinge, yet the

Triorchites 314



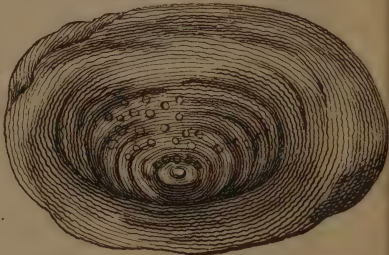
Strombites 303



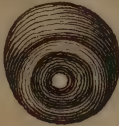
Bucardites 313



Mamillaris 316.



Eye Stone 316.



the shells of these are commonly found apart. Among these are those called the Stromboites, from their wreathing like a screw, and generally from the right hand to the left, and from the greater to the smaller end. The largest exceed nine inches in length; but those in *England*, at least that have been hitherto found, are not much above five, with a plain surface; and the least are not above half an inch long, but curiously streaked. They are of an ash-colour somewhat inclined to yellow, and of a harder consistence than the stone in which they lie.

There are some petrifications that resemble cockles, scollops, and oysters; and these are very numerous. The CONCHITES or cockles may be divided into the greater and the less; whereof some of the greater are streaked with broad streaks and pretty deep furrows, descending as it were from a centre at the top, and expanding themselves to the rim of the stone. They have also six or seven transverse simple lines, bent circularly to the hinge or joint: these appear to be a stone without, of a dark ash colour; but within they are found to be black flint. There are others again whose streaks descend from the hinge or joint, and yet not in straight lines, but undulated, and much broader than the former. *Aldrovandus* gives an account of some that are much larger than those found in *England*; but then they are the real natural shells, and not petrifications. This is to be met with at *Great Rollwright* in a blueish clay, and is not much harder than the clay itself; it is also of the same colour, though it is covered with a bright and shining substance. There is another sort whose lines or streaks are not drawn, like the two former, from the joints of the valves to the rim, but transversely and circularly from one side of the stone to the other, the lesser circles being placed next to the joint. This seems to resemble the Wrinkled Cockle of *Rondeletius*, with valves swelling very high. They are of an ash colour inclining to yellow, but they are not hollow, for they are solid stones, and much of the same texture as the rubble of the quarry in which they are found.

There are several kinds of the smaller Conchites, which differ in their colour, lines, and valves; for some are yellow, and are found in the fields near *Burford* in *Oxfordshire*: their valves rise high, and approach to a roundish shape. These made red hot, and put into beer, are accounted by the country people to be an immediate remedy for a stitch. In another part of this county there are some of this sort that are flatter, and of an ash colour; but in both the lines run from the joint to the rim. These last are found only at the head of a spring, but never at any distance from it. Some have thought that they have been brought out from among the rocks at the bottom of the hill where the spring rises; others that they are formed by the peculiar virtue of the water which runs over rubble-stones near its rise; and it is said that if they are picked away never so clean, in a few months time there will be as many more. Some of these have been found only streaked on one side, and rubble-stone on the other; and others have but just begun to be marked with lines.

There are others of this kind found in a bank of yellowish clay, and they are of a different form from those just mentioned, for they are streaked transversely. Many of them appear to be hard stones, and yet several that have been met with were nothing but clay; which may justly raise a doubt, whether or not many of these, which have been generally supposed to be petrified shells, are properly so called.

There is another sort of Conchites found in *Horn-ton* quarry, nearly approaching to an oval, and scarcely streaked at all; which inclines *Dr. Plott* to think that these stones, which are so like cockles, never were in reality the shells of that fish. *Dr. Lister* is of the same opinion; for he takes them to be real stones of a particular kind, differing not only from each other, but from any real shells that were ever yet met with in any part of the world.

There is still another sort of Conchites found in *Hornton* quarry, which is not stony on the inside like the former, but is hollow, and filled up with spar. It is sometimes in irregular figures, but generally forked.

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The base, or place where the branches of the fork are united, is at the joint or hinge of the valves; which seems somewhat hard to account for.

There are also petrifications or stones which resemble scollop-shells, and are always found separate. One of these is very curious, and resembles the Rough Scollop of *Aldrovandus*. It is of a yellowish colour, and has ears on both sides, with lines that run from the hinge or joint to the rim of the shell. These are very prominent; and there are others that run transversely, not bending towards, but from the hinge or joint: however, these do not pass through the deep furrows so as to join with each other, for they are only upon the ridges. There is another kind of scollop where the direct and transverse lines are of an equal depth, but very shallow, very numerous and fine. In these the transverse lines bend towards the joint. It is of a light reddish colour, with ears on both sides, and is found in the quarries of *Heddington* in *Oxfordshire*.

There is another shell or stone like a small scollop, and of a whitish yellow colour: the streaks are large and broad in proportion, but the transverse lines are small and narrow; however, it is eared, like the former, on both sides. These are called *Pectunculi* by *Rondeletius*, and he makes them a distinct species from the larger sort, which he names *Pectines*; but then those that he speaks of have never more than one ear, which is sometimes on the right and sometimes on the left side; but this has ears on both sides. There is another of the small kind entirely without ears, nor is there any sign of the ears being broken off; however, there are real shells of this kind taken notice of by different authors. There is still another sort resembling a scollop, or, as some think, a sort of cockle, because it bears too much on one side for the former. It cannot be a *Tellenites*, because if it has any streaks at all, they never run that way. These are in great plenty in several parts of *Oxfordshire*; some of which are large, and as it were heaped one upon another; and others single, or found by themselves. The real shell-fish that answers to these are called *Streaked Cockles*; but they are always very smooth within,
whereas

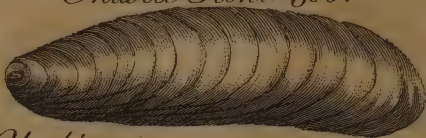
whereas some of these are evidently streaked on the inside; and the streaks not only run from the joint or hinge to the rim, but there are four or five broad transverse streaks, made up of several lines almost close to each other; for which reason some would have it to be a stone of a particular kind.

Besides the shells already mentioned, there are others that seem to be of the oyster kind, which are very common in the gravel pits in some parts of *Oxfordshire*; among these, there is one of an oblong shape, which is very thick, and of a blueish colour, and seems to be the same as the thick oblong concha taken notice of by Dr. Merrett, which he found in *Worcestershire*, where they are called Crow-stones, Crow-cups, and Egg-stones. *or Gryphites. see plate at p. 159.*

There are other shells or stones that have some resemblance to muscles; but they are of an odd sort of a figure, and there are no real shells that we know of like them. They are not hollow, but are filled on the inside with a stony earth of a yellowish colour, and their covering is white and shining, with oblong lines. It is very long and narrow in proportion, and it is marked, but very faintly, like the shell of a common muscle. There is another of this kind which is exceeding small: but is somewhat like the former for shape, only it is a little more oval on one side; for in the former only one of their sides is oval, and the other a little concave. There are also detached oyster-shells found, that resemble those of common oysters; some of which are blue, and others reddish, or of the colour of the gravel in which they are found. They are generally larger, thicker, and heavier than the true oyster-shells; which perhaps may be owing to their petrification. However, there are real or true oyster-shells in many places, which have undergone little or no alteration, only perhaps they are a little softer. They have not the least mark of distinction from the common sort; and they have been found unopened in many parts of the world, particularly near *Reading* in *Berkshire*, where the labourers who are at work in digging the hill have always some ready to present to strangers.

There

Muscle Stone 306.



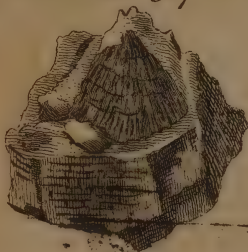
Sea Urchin 307



Porcupine Stone 307.



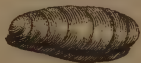
Echinites 307.



Sea Hedghog 307



Muscle Stone 306.



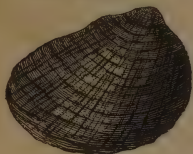
*Ammon's
Horns
308..*



Conchitas 303



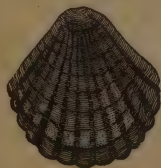
Conchites



Oyster Stone 306.



Conchites

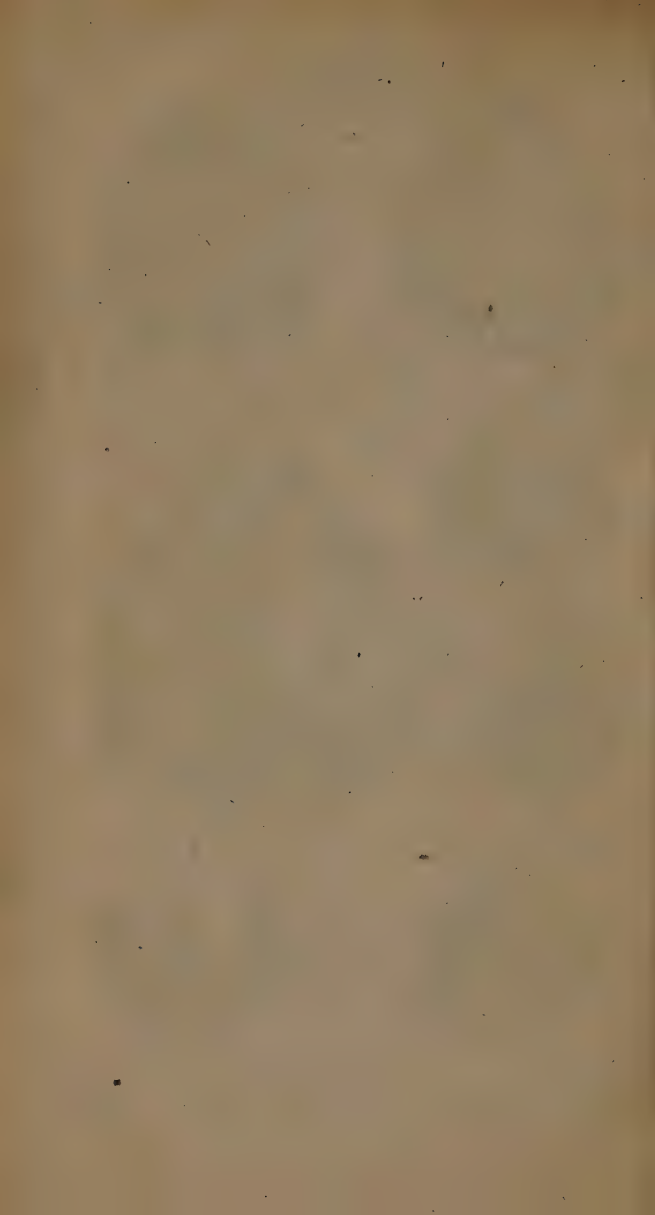


Snail Stone 313



Pear Stone 312.





There are other petrifications resembling shell-fish of the softer crustaceous kind, which for substance and hardness are much like a pebble, and of a yellowish colour. They are divided at first by five pretty strait lines, adorned on each side by a double row of points, ascending from a protuberant centre in the basis of the stone to another of the same shape at the top, but foliated round in the manner of a rose. It is likewise subdivided by five other indented lines, which terminate before they reach the centre; but they make the spaces between them appear like pentagons, or like the shells of some kinds of tortoises. *Aldrovandus* takes notice of a stone of this kind, which he imagined resembled the Sea Hedge-hog deprived of its prickly coat. Dr. *Plott* calls it the Porcupine Stone without bristles. There is another that is curiously embroidered, and resembles the Sea Hedge-hog of *Imperatus*; but it differs greatly from the former in colour and substance. It is of a whitish ash colour without, but within a hard black flint covered over with thin glittering plates placed edgeways on the ball of the flint, and which compose the uniform eminences and depressures with waved and transverse lines. *Boet* calls them Serpents Eggs, because some have supposed they were formed by serpents, on account of their basis, which is plain and smooth, being beset as it were with five serpents tails, or rather like those of lizards, and which turn up towards the upper part. Those of *Boet* are of a whitish brown colour without, and entirely white within. Under the outer crust was a coat of flint, under which they were softer, and they were of the shape of a hemisphere. Some have taken these stones to be the eggs of land tortoises hardened into stone; and the rather, because the upper part of the stone pretty much resembles a tortoise: though others suppose it to be a real stone of a peculiar kind. These are found in great plenty in the Isle of *Malta*, where they are called by the country people the Breasts of *St. Paul*, because sometimes two of them are found together.

There is another sort of HEDGE-HOG STONE, which resembles the shell of a kind of sea hedge-hog; and
it

it is said to be like the stellated eggs of that hedgehog. Their outermost coat is full of sharp prickles, upon which account they are sometimes called Sea Chestnuts, because of their likeness to the rough prickles that encompass chestnuts while they are on the tree. When they are dead all the prickles will fall off, and then the shell is discovered, which is curiously wrought, and resembles the stone of which we are now speaking. They consist of many compartments and eminences, which are so regularly disposed that the most ingenious embroiderer cannot easily imitate them. One of these was found in the parish of *Teynton* in *Oxfordshire*, according to *Dr. Plott*; where there is also another kind much smaller, for it is not bigger than a rouncival pea; and yet the lines of compartment and other eminences are as large as the former, but not so numerous. It may be doubted whether there is any animal with a shell like this stone; for no account has been given of any such hitherto. There is also another kind of Echinites or Hedge-hog Stone found in the quarries near *Shotover Hill*, which is very like the fifth Sea Hedge-hog of *Aristotle*, as it is figured by *Rondeletius*. The inward shell of this fish is very small, though the prickles are long and stiff; and it is always found in the deepest waters sticking to the rocks.

The CORNU AMMONIS, or *Ammon's Horn*, is so called because it is like the horns of rams which were consecrated in the temple of *Jupiter Ammon*, seated in the sandy deserts of *Lybia*. They were formerly taken to be petrified serpents, and several authors have compared them to the nautilus, or have confounded them with each other. The unpetrified *Ammon's Horns* are divided by several partitions, but they have fewer sinuosities than the nautilus, and they have no small pipes that run through them to preserve a communication one with another. There is also some difference in their covering, for the nautilus is very smooth, or at least the streaks of the surface only answer to the windings on the inside, and are very broad; whereas *Ammon's Horns* have several external turns, are covered often with tubercles, and almost always with streaks. There
are

are plenty of the fossile kind in the county of *Oxford*, which are of different colours, shapes and sizes, but always so curled up that the place of the head is in the circumference, and the tail in the centre of the stone. Some are small, with protuberant parts swelling almost to a round; others are broader and more depressed; but the lines in both are undulated, and extended from near the centre to a single-edged ridge on the back of the stone. In this respect they differ from a third sort that has broader lines, but not undulated, and they terminate at the large protuberances on each side the stone, between which and the broad back thereof there run other lines; the whole body of the stone being likewise divided into sutures, not much unlike the leaves of an oak. The two latter of these are perforated at the centre, and therefore they are called by *Baubine* the bored *Ammon's* Horns. They are all three adorned with a shining brass-coloured coat, of a brightness equal to the metal itself. *Boet* affirms it is of a gold colour, upon which account it is by *Pliny* ranked among the gems: he says that *Ammon's* Horn is reckoned among the most precious gems of *Ethiopia*, and that it is in the shape of a ram's horn, of the colour of rusty iron, which by means of alum immediately turns into a copper or gold colour, just in the same manner as iron itself will do with the same salt; however, he should rather have said with Roman vitriol, because that is well known to have such an effect upon iron. However, it may be remarked that Dr. *Plott* is guilty of a small error, for he takes these to be the words of *Boet* himself, and not of *Pliny*; likewise he represents him as saying that the gold colour proceeds from its lying in the earth, which is sated with aluminous juice; but there is no such thing mentioned by either them, whatever their meaning might have been.

A sort of these stones have been found in the parish of *Cleydon* in *Oxfordshire*, which have many more turns than the former, though they are not much bigger; but they are without a covering, and are of a yellowish colour, with streaks that run from the innermost part of the stone, and are all single except that

that some of them are divided into two parts before they reach the rim of the stone, where they terminate with a back much more protuberant than the rest of the stone, though streaked in the same manner. There are also others met with that are not stones like the former, but consist of a fine stony earth, or hardened yellow clay; contrary to the opinion of some authors, who affirm they are all of the same consistence.

The OPHIOMORPHITES nearly resemble the former, and are so called from their being like serpents rolled up. Some of these are also found so soft that it is easy to break them with the fingers; but there are others that consist of a hard blueish stone. They differ from these in their lines or furrows; for in the former the streaks are wider, and more open near the rim; but in some of these they are closer, and also united into pretty large protuberant knobs on each side the back of the stone, which in these is broad and somewhat rising, and is crossed by other crooked or curve lines that run between the eminences. There are other stones of this kind that have only strait single ribs, which likewise terminate in strait ridges, that run on each side the back of the stone; between which there is a third that is more prominent, and might be taken for the spine of the back; however, it is not wreathed, but plain like those on each side of it; and it appears to be same as the crested *Ammon's Horn* of *John Baubine*. One of this kind is about four inches in diameter, and is made up of the like number of turns; but some are of eight inches diameter. The largest of this kind in *Oxfordshire* was found at *Landford*, near *Oxford*, and is eleven inches over, and weighs seventeen pounds. The ribs are single, and there are no knobs or ridges at the back, which is plain and even. Dr. *Merrit* takes notice of one that was twenty inches in diameter, which was inlaid with a small sort of cockle shells; that is in its sides, whose segments, if they may be so called, are within the body of the stone; and therefore Dr. *Plott* takes it to be of a different kind.

The BELEMNITES are so called from the Greek word *Belemnion*, which signifies a dart, because they are
nearly

nearly of that shape. Authors are not agreed in what class to place this stone; for *Luyd* takes it to be the form of the fish called Narhwal, or a concretion formed in shape of the *Pennicella Marina*. *Helwing* would have it to be a sea plant, and *Woodward* a mineral production of the earth. *Lang*, in his history of the stones of *Switzerland*, thinks it is a sort of a Stalactites or fossile pipe, formed by flowers. *Wolkman*, in his Subterranean *Silcfa*, would have it to be the thorns of the back of some animal; and *Ehrard*, in his dissertation on the Belemnites, says it is the covering of the cells of a shell fish, which is a kind of nautilus or *Ammon's Horn*; though instead of being spiral it is strait. *Bourquet* maintains they are the teeth of a crocodile or some sort of whale; and *Buttner* places them among the foreign fossils. *Klein* pretends they are the prickles of a sort of hedge-hog; and *Linnaeus* refers them to the class of shells with several cells. The shape of the Belemnites is sometimes conical, sometimes cylindrical, and they most commonly consist of a substance that is black and horny; the length is from two inches to eight, and the diameter from the sixth part of an inch to three or four inches in circumference. The inward parts consist of rays, and there is generally a cell at the large end, and a furrow that runs from the top to the bottom. Dr. *Plott* informs us that when they are rubbed against each other, or are scraped with a knife, they have the smell of rasped horn, and that their texture consists of small threads which run like rays from the centre, or rather from the axis of the stone to the surface. When burned they have likewise a smell like that of horn; and the greatest he found was somewhat above four inches in length, and in thickness about an inch and a quarter. It was hollow at the top, about an inch deep, and filled with a kind of gravelly earth. It was of an ash-colour, inclining to yellow, and if rubbed briskly would take up straws like amber. He found also some of a blueish colour, in a blueish clay, hollow at the top; and some of them instead of one had three furrows, whereas the former had but one furrow or chink. He met with another of an ash-colour, hollow at the top, and
without

without a chink. He likewise found a fourth sort, which were very common in the gravel-pits in the suburbs of *Oxford*; they were not hollow at the top like the former, but radiated like a star from the centre; and these by some are called the male Belemnites, and they are always of an amber colour; however, they will not attract straws, though they are somewhat transparent, and, when rubbed or burnt, smell like the urine of cats. The *Germans* pretend these sort of stones are good against the night-mare and the stone in the kidneys, and they give it in powder from half a dram to a dram.

There are other stones that represent herbs and plants, among which are FUNGITES or TUBEROIDES, so called from their resemblance to fungi or mushrooms; these are of an ash-colour without, but a black flint within. Others resemble only the parts of plants, one of which has been met with like a root of briony broken off transversely, which shewed the small fibres that run from the centre to the circumference; as well as the other streaks that run down the sides, and the annular divisions. Likewise the colour is so like that of briony, that it can hardly be distinguished from it except by the weight. It was found in quarries of rubble-stone near *Shotover Hill* in *Oxfordshire*.

There are other stones like the fruits of trees, some of which are called PYRIFORMES, from their likeness to pears: one of these was found of eleven inches in circumference, and in size and form resembling a king-pear. This was a black flint; but there is another that is whitish without, and yellow within, in the shape of a warden pear. Other stones have been found in the shape of apricocks, with the cleft or furrow from the stalk to the top, exactly representing a real apricock; likewise there have been spars found resembling mulberries, and white flints in the shape of *Lucca* olives.

There are also stones in the shape of those belonging to fruits. Most of these have a kind of pedicle or stalk, from which they seem to have had their growth, and are ridged and furrowed the whole length of the stone. Their texture is very curious, they being made up of
little

Bufo nites 315



Bucardites 313



Otites 316.



Diorchitis 314



Olfactory Nerve Stone



Thrichites 314



little thin plates, not unlike the stone called the Selenite, only they are opaque, and the bulk of the stone much different. The plates seem to be made up of strings, some of which run two ways, and others three, and according to their directions the stone will readily cleave; yet they are all oblique to the axis of the stone.

There is another kind that are much more slender than the former, and plain and smooth on the outside; these are taken notice of by *Cæsalpinus*, and he takes them to be the true Tecolithus of *Pliny*, which he pretends will break and expel the stone, if the patient does but lick it. It is of a whitish yellow colour without, and breaks into shining white plates obliquely to the axis of the stone, like the former.

There are other stones that resemble animals either entirely or in part, among which there are some that seem to have been petrified reptiles, and very likely have been really such, which may easily be accounted for without the help of a flood. There are others that represent the shells of garden snails, and are very numerous. There are others called Worm-stones, which are of two sorts, and one of them is of a whitish yellow colour, but not hollow within, for they seem to be of the same texture with the pebble-stones among which they are found. Some of them are of the size of a small quill, and lie in the rock in mezzo-relievo, and are irregularly contorted much after the manner of vermicelli; whereas the other sort lies in the very body of the stone, and is of a white colour; and it is irregularly curled up like the spring of a watch.

There are some stones that represent the parts of four-footed beasts; particularly in the quarries at *Heddington* there are some that are like the head of a horse, having the ears and crest of the mane, with the places of the eyes, as prominent as in a real horse; and the rest of the face entire, only the mouth and nose are wanting in them all. These are not uncommon, and they are of several sizes; though they are not taken notice of by any ancient authors. There are other stones in the form of hearts, and on account of their size are by authors called Bucardites, or stones like

like bulls hearts. They are of a whitish yellow colour, with a smooth plain surface; though there are some that are ribbed on each side, and these are ten inches in circumference, and weigh about two pounds; though there have been some found that have weighed twice as much.

The ORCHITES, or Lapides Testiculares, are so called from their likeness to the testicles of men, as well as of beasts. They are generally found in pairs, and close together; and these are called Diorchites; but it sometimes happens that there are three found together, as they have been in some monstrous animals, and then they are named Triorchites. Some are to be met with of a prodigious size. Dr. *Plott* mentions some in particular that have been found on the western side of *Shotover Hill*; and indeed it seems to be composed thereof, if only the outward appearance be regarded. He cannot imagine how they should come there, nor of what animal mould they are formed, if they are not owing to the plastic power of the earth.

He met with some sorts of stones in the quarries of the rubble-stone near *Shotover*, which were composed of filaments like hair; and which could not be the Polythrix of *Pliny*, because they are not greenish, nor the Bostrychites of *Zoroaster*, nor the Corsoides of *Pliny*, because they are neither grey nor long. However, it is a sort of Thrichites, because it is most like the short hair of beasts. The colour is yellowish, and each hair when viewed through a microscope appears to be streaked and furrowed throughout its whole length.

Some stones have been found accurately representing the combs of bees, with the cells of each cavity all hexangular, exactly like those of honeycombs. There was one stone found in a marl-pit that was very like a mole both in the head and tail, but more especially in the foot; it was so very exact that it was divided into claws, and represented the foot of that animal in all particulars. Another was of the shape and size of a partridge's skull, with the eyes and short beak, and was hollowed behind just as if the brains had been taken out: to these may be added still another, which was the accurate representation of a pullet's heart, with

the fat near the basis thereof, and the coronary vessels descending from it most exactly delineated. All these are taken notice of by Dr. *Plott*.

There are some stones that seem to belong to the oviparous quadrupedes, among which is the Bufonites or Toad-stone. *Boet* informs us that it is called by the *Germans* Crottenstein, and that it is the common opinion that it is vomited up by a toad. But he thinks they may be referred to the star-stone of the darker kind; for they are variegated with dark spots, and are of the same colour as those stones, only that the grey or ash-colour inclines a little more to redness. It is convex on one side like an eye, and the other side is concave. Some have called this Batrachites, others Brontia, and others Ombria. Authors acquaint us there are two kinds of these, the first of which contain those that are called Brontia and Ombria, which are sometimes of a dusky reddish, yellowish, or greenish colour, of the size of a hen's egg. From the flat or the concave side there generally runs five lines to the centre of the convex side, at equal distances, and marked with exceeding small tubercles. Some have been of opinion that these stones are the offspring of serpents, and others that they fall in the time of thunder storms; and others again, that they are the hardened eggs of tortoises. To this kind may be referred the stone called by *Gesner* the Serpent's Egg. The other sort comprehends the lesser stones, which rarely exceed the size of man's nail, and are generally by the jewellers sold for the true Toad-stone. They are both found in fields, and often among reeds, brambles, thorns, and the like places, where toads are usually concealed; which perhaps may give rise to the opinion that they proceed from toads.

The BUFONITES that Dr. *Plott* takes notice of, he says is not that fine polished stone that was shewn by Dr. *Merrit*, and was nothing else but the jaw tooth or grinder of a sea wolf; but a something reddish real stone like the segment of a sphere, convex at the top, and concave underneath. They have been found among the gravel in *Magdalen College* walks, and he thinks they have their name from their resemblance to

the shape of the scull of a toad. He adds that one of the stones, called the Brontia, has some resemblance to the basis of the brain of a man, or the Cerebellum while it is yet included in the membrane called Dura Mater, with the several pair of nerves cut asunder that proceed from it. Besides these there is the exit of the Mammillary Processes, and several pair of nerves. This was found in the *Chiltern* country, and much better deserves the name of Encephaloides, than any described by *Aldrovandus*.

There has been another stone found in the rubble-quarry near *Shotover Hill*, which is a lively representation of olfactory nerves entire and whole: many of these are of a yellowish colour, smooth without, and hollow within. Dr. *Plott* found another of an oval shape, and chiefly of a reddish colour; but at one end it had a circle of white within, which is a zone of the colour of the stone, and then a round pupil of white, so that it looked like an eye darkened by a cataract. This might have been mistaken for the stone called the Eye of *Belus*, if *Boet* had not expressly asserted the body of that is of a white colour. It comes nearest to that which is described by *Pliny*, and is called *Leucophthalmus*, which he says is of a reddish colour, and is in the form of an eye; but then his had the black pupil, and this has not; however, it may certainly be placed among the eye-stones.

There are other stones which resemble the ears of a man, though much less, and Dr. *Plott* calls them *Otites* or *Auriculares*; and they are common in the rubble-quarries near *Shotover*, but more so in a bank near a spring at *Somerton* town's end, eastward from the church. There are other stones met with in the shape of human breasts, having not only the nipple, but the areola studded with small protuberances, and therefore may be properly called *Mammillares*.

There are other stones which exactly resemble the heart of a man, with the trunk of the descending part of the vena cava, as also the ascending part of the vein of the same name. Likewise from the left ventricle there proceeded the trunk of the great artery, and a portion of the same artery tending downwards.

Within

Within it appeared to be a whitish sort of flint, and certainly deserves the name of *Anthropocardites*. Another was found by Mr. *Banister* of *Magdalen College*, but not so exactly in the shape of a heart as the former; it was stellated all over from the basis to the point.

Other stones have been found exactly representing the private parts of a man; and others in the shape of kidneys, with the trunk of one of the ureters descending from the hollow part of it. When found it was of the colour of a kidney, and was so soft that it might be readily cut with a knife, that is, the part of it resembling an ureter; but in less than an hour's time it grew as hard as the rest of the stone.

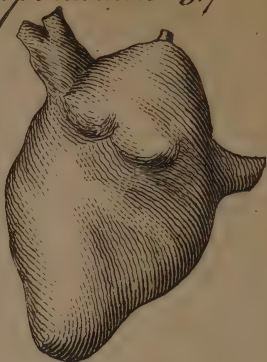
Some stones have been met with in the shape of human bones, and particularly one exactly resembling the lowermost part of the thigh-bone of a man, with the lower head; between which are the anterior and the larger posterior sinus, which is the seat of the strong ligament that rises out of the thigh, and that allows a passage to the vessels descending into the leg. A little above the sinus, where the bone seems to have been broken off, there is a shining spar-like substance, resembling marrow in the hollow of the bone. Its circumference near the head is exactly two feet, and at the top above the sinus about fifteen inches, and the weight is near twenty pounds; which shews that the bulk is too monstrous to have belonged to a man, though it is precisely of the same shape. However, Dr. *Plott* is of opinion that it was a real bone, though now in the state of petrification. With this there was found a tooth that weighed two ounces and a quarter; but it was not at all petrified, which perhaps may be owing to the nature of teeth, whose hardness and want of large pores does not so readily subject them to petrification: for the same reason in graves they are often found sound and good, when all the other parts have been consumed. Not far from *Bath* in *Somersetshire*, there have been hatfuls of teeth picked up by those who followed the plough, though no other bones were met with to which they might have supposed to belong. We are informed by *Taxellus* in his history of

Sicily, that two large skeletons were found, which, when they came to be touched, all fell into dust, except the teeth called the grinders. What animal the thigh-bone above mentioned did belong to is hard to say, though some have taken it to be the bone of an elephant brought over by the *Romans* when they were masters of this kingdom. However, it does not appear from any authors, that those animals were ever brought over into *Britain*; and yet it cannot be denied that several have been brought over hither for publick shows: but whether any died in *Oxfordshire*, and were there buried, must be left to the judgment of the reader.

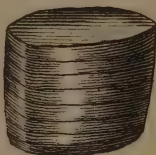
There has been a great number of monstrous teeth found in different parts of *England*; and in *Effex* there were two met with in the reign of *Richard I.* which were large enough to make two hundred each of the common size. One dug up near *Maidstone* in *Kent* was near seven inches in circumference, and weighed five ounces and one eighth. In the year 1666, after the fire of *London*, when *St. Mary Woolchurch* was pulled down, there was a thigh-bone found larger than the above-mentioned, which however was not turned to stone. There was also another found in *London* three feet and two inches long. After all we may be certain that these bones did not belong to elephants, because they are of a quite different shape, which has been found by comparing them together; and therefore *Dr. Plott* was of opinion they belonged to men or women. To support his opinion he takes notice of the sizes of the several giants that have been mentioned by authors; and he likewise mentions a giant in *France*, who lived there about two hundred years ago: this man was said to be so tall, that a man of a common stature might go upright between his legs. He also takes notice of several others; but the tallest he saw himself was at *Oxford*, and was a woman brought there for publick show, who was seven feet and a half high, and all her limbs proportionable.

Dr. Plott likewise takes notice of a stone found at the foot of *Shotover Hill*, which represents the leg and foot of a man cut off above the ankle, and which from
the

Anthropocardites 317



Petrifaction 317



Kidney Stone 317



Scrotum Humanum 317



318.



the toe to the heel is about a yard long. However, he does not take this to be a petrification, but a stone formed in this shape by the plastic power of nature.

Besides these stones resembling the parts of animals, there are others not unlike things made by art. Among these are some in the shape of buttons, and others like the heel of an old shoe, with the lifts plainly distinguished from each other. One of the button stones was found at *Teynton* in *Oxfordshire*, pretty near resembling a hair button.

Stones of this kind are called by Dr. *Plott* PORPITÆ, which other authors would have to be fossil corals, but why they should be found in the shape of buttons is not said; nor indeed can there be any reason given why they should be placed in that class. Other stones have been seen like the bags called the Sleeves of *Hippocrates*, made use of by the chemists; and there have been three one above another, as they usually place them. There is another stone of an ash colour called Trochites, from its likeness to a wheel; for it has rays or spokes which proceed from the centre, like those of a cart-wheel from its nave. These are said to be akin to the *Jews* Stone with regard to their texture, and to the *Asteriæ* in the property of moving in vinegar. Some of these are called Entrochi, or Wheels within Wheels; the rays of one of the Trochites being in relievo, and always lying in the furrows between the two protuberances of the other, as in the futures of a scull. *Boet* also affirms that these stones are akin to the *Jews* Stones, and are called by the *Germans* Spangestein or Rederstein, because they represent the figures of wheels. The round part is smooth, and the nave is flat; from which, as in common wheels, the prominent rays proceed to the outward circumference, so as to leave furrows between them. When broken it shines like a *Jew's* Stone, and is smooth; and this may be done in any direction. He adds, that before the trochites are separated from each other, the stone is called Entrochos, because it consists of the conjunctions of several trochites. They are joined together so curiously, that they seem to be the effect of art; for the spokes of one are inserted in the

furrows of the other, so as to represent the sutures of a human scull, as was before hinted. Sometimes there are twenty united together in this manner. When the Entrochos is smooth in every part, the spokes are prominent. These stones differ in colour from each other, for some are white, others ash-coloured, and others again yellow: they differ also in size, for the largest are near an inch broad, and about a third as much thick. It is found in *Saxony*, in the clefts of marble, of a whitish ash-colour. Dr. *Plott* has met with some few which had every second, third, or fourth joint larger than the intermediate ones; as also with one that tapered at both ends, and swelled in the middle like a barrel; but the rays or spokes were very obscure. Dr. *Plott* adds to what has been said before of the texture, that the rays inscribed at the top of these stones are made out of the edges of one of these courses of plates obliquely like a pack of cards, endways or edgeways, according as the streaks appear long or short; though there are some that have the rays made of the edges of plates that are set obliquely, but quite in a contrary position to those of the former. He also farther observes, that when they are broken or scraped they emit a stinking nauseous smell, which the *Jews Stone* will not do; and therefore he concludes, though the texture is much the same, they must arise from different principles. Another that was given him had a double row of rays or spokes, the first of which run from the centre or nave, which is in the form of a cinquefoil, about half way to the circumference, where they are cut off with a deep hollow trench, taking up above half the remaining distance of the rim. He had also another with four equi-distant rays or spokes, much larger and more prominent than any of the rest. Besides all these he had still another, that had an indented line running thro' the rays near the circumference of the stone.

The Entrochi of *Staffordshire* are much larger, longer, and consequently compounded of more trochites, than those of *Yorkshire* or *Somersetshire*; for some are three inches and a half in circumference, whose centre or nave is half an inch over. One found in a rock

was near six inches long, but it was so fast inclosed that it could not be got out entire. Some of two inches and a half long consisted of thirty-five trochites.

At *Beresford*, and other places in *Staffordshire*, there are stones that seem to be made up of thick trochites, that have no bore at all, nor any rays at the top proceeding from a solid centre; which is no wonder, because when they are broken they do not seem to consist of plates like the rest. There is another sort that seem to be made up of joints like the *Entrochi*, in which the trochites neither appear round nor square on their outermost rims, but sharp like the edge of a screw, tapering from the place of their joining, and are streaked on their surfaces; so that the rays of one do not enter into the furrows of the other, nor yet do the rays join to the centre at right angles; and this in these is a large cylinder of black flint. Neither are all these cylindrical as the former, for some of them taper upwards from a broad basis, the lowermost rims being greatest, and decreasing gradually to the top. Some of these are so different from the former, that they have a thin streaked plate passing from each rim to the sides of the cylindrical concavity; so that there appears a distinct concavity between each ring. Some again have others included within them, and appear like rings parallel to each other, and not like a screw, as those mentioned by *Dr. Lister*; nor do the protuberant edges of the one enter into the furrows of the other, like the male and female screws.

Some sorts of these stones, that have such cavities, are in the form of five columns joined together without any addition; and others are bound by thin rings that stand pretty thick and at equal distances, which are not streaked. Some again are knit together by the same sort of rings, that are only in pairs, there being some distance between each pair; and others have four placed in the same manner. There is still another sort fenced in the same way, some of which are cylindrical, that is, of an equal bigness from the bottom to the top, and are curiously wrought in small rings, first with two at some distance, and then with four close

together; and so on alternately the whole length of the stone: but others, though like the former in other respects, are bigger both at the top and at the bottom, and resemble a pillar with a pedestal and capital. Lastly, there are some very small ones that stand in cavities like strait smooth pillars, only they are marked with a row of knobs on each side; and there are others that look like so many buttons piled upon each other.

ASTERIÆ, or STAR-STONES, are found in several parts of the kingdom, and particularly in the fields about *Cleydon* in *Oxfordshire*. They consist of thin plates lying obliquely to the horizontal position, much after the manner of the *Jews* Stone; and the colour is various, according to the different soils in which they are found: for this reason, in *Glocestershire* and *Yorkshire*, where they are taken out of a blue clay, they are nearly of the same colour; and they break like flints with a dark shining surface. In *Warwickshire*, as well as in some parts of *Glocestershire*, they are of an ash colour; and at *Cleydon* they are yellowish, because they are found in a yellowish earth. They are here about an inch and a half in length, and seldom less than an inch in circumference: and whereas in other counties they are so hard that it is difficult, if at all possible, to separate one from another without spoiling them; yet if these are steeped in vinegar for a night, they may be divided the next morning with safety and ease. They likewise differ from those of other places in shape; for, besides the sculpture that makes up the angles, there is the representation of a rose in the middle thereof; which is not commonly seen in those found elsewhere. Dr. *Lister* affirms they all seem to be fragments, and not entire bodies; and are sometimes found in one single joint, and sometimes there are fifteen in number lying one upon another. According to what has hitherto appeared, about twenty joints go to an inch; and from thence it will follow, that some of them must consist of thirty joints. Every joint consists of five angles, which in some are very obtuse, and in others more acute. The middle of each angle is a little hollow, and the edges more prominent,

minent, with thick furrows, by which the several joints are connected together, their ridges and furrows being alternately let into each other.

Boet gives a description of them which differs very little from the former: though he says the substance is pretty hard, and they are so very closely joined together that they could not have been done better by the best workman, yet he could easily separate them from each other; however, he never found above eight of them at a time so connected.

Many of the longest jointed Star-Stones have some of their joints a little broader and more prominent than others, dividing the whole body as it were into certain conjugations of two, three, or more joints, which, as *Dr. Lister* observes, are marked with sets of wires, as he calls them: however, *Dr. Plott* could not perceive any in those he found at *Cleydon*; but yet, when he put some of them in vinegar, he could perceive bubbles at those very places, standing at the orifices where those wires formerly were probably inserted. Those in other counties are generally a little bent; but those at *Cleydon* are not, which may possibly be owing to their shortness.

There are some found about *Swerford* in *Oxfordshire*, which are not so large as those at *Cleydon*, for they are never a full inch in circumference; but the conjugations or prominences of some of the joints beyond the rest are more visible in these than in those of other places. The Star-Stones found in *Staffordshire* are exactly of the same shape, in which stars are commonly painted; for they have all five principal rays of an equal length, shape, and make, and proceeding from the centre, which is either solid or hollow, and where they join in angles of seventy-two degrees. They differ somewhat from each other in the different places where they are found, as also from those in *Oxfordshire*, as well as from those taken notice of by *Dr. Lister* in the *Philosophical Transactions*; for tho' they are placed on each other in columns, and seem to be fragments, some having three, four, or more joints, yet none of them seem to be made up of plates lying obliquely to the horizontal position of the star; and
some

some of them have their angles so very acute, and consequently their sides so deeply furrowed, that they seem to represent the rowel of a spur, without any sculpture or indented future; but when there is any such, they are of a quite different kind from those already mentioned.

The first sort are placed in a case of a flinty kind of stone, consisting of five angles; and the rays proceed from a solid centre of a coal-black colour, not bigger than a common pin; yet they are evidently of a flat figure consisting of five angles; though the angles of the inner one do not point against the sharp rays of the outer, but against the deep furrows between them; however, they are both smoothly jointed, without any hatching or engraving.

The second sort consists of a flat and not hollow-sided piece, such as Dr. *Lister* has described in the Philosophical Transactions; and the hatchings thereof are very different from all his. There is one principal ray which extends itself from the centre to the extremity of each angle, with oblique lines proceeding upwards therefrom, in such a manner that they in some sense represent so many boughs of a tree.

The third kind has also flat sides; but the joints are all unequal, one of them being always more protuberant than the next, and so alternately throughout the whole column. It consists of twelve joints, and the hollow of each angle, is neither hatched on the top, nor is the column bent, or the least inclining, as those commonly are which are of a greater length. These have the property of moving in vinegar, like the former; and this property seems to have been known to *Roger Bacon* near five hundred years ago; for in one of his epistles he affirms they would run in vinegar.

The ASTROITES are akin to the Asteriæ, and are of different sizes, but are adorned all over with many stars; and there are no less than four different kinds found in *Oxfordshire*, in two whereof the stars are in mezzo-relievo, they being prominent and standing outwards, with the streaks descending from the centre at the top and all sides to the rock on which they grow. Some of these are of a larger and others of a
smaller

smaller kind, which are both found in the quarries of rubble-stone. There is a third sort which are more beautiful than the rest, and are intagli, that is, deeply engraved like a seal, and streaked from the prominent edges above, to a centre in the bottom. These are generally hexagons, and sometimes pentagons; and yet they agree with the former in this, that the stars are only superficial, and not found in the body of the stone.

The fourth sort has been imperfectly described by *Gesner*, and after him by several others. The streaks of these are like the third sort, descending in a concave; but from the edges are generally round, or with five angles at the top, and tend to a centre, but not of their own kind, for they are smooth and apparently prominent. They are found in quarries of rubble-stone, and are stellated not only on the surface of the stone, but quite through the depth thereof; yet not so as to have one continued star reach through the whole, but many, according to the thickness of the stone; for about ten of them lie in the depth of an inch, much after the same manner as the star-stones; only they are not separate, but join together, and make as it were so many rows of the stone. Some of these are so large in *France*, that they have been there used for the building of walls and houses; but with us they are generally employed in paving causeways, particularly in *Oxfordshire*.

The property of moving in vinegar is common both to the *Asteriæ* and the *Astroites*; though the *Asteriæ* will move not only in a whole joint, but two or three connected together; whereas the *Astroites* must be broken into very small pieces before they will move. The *Asteria* has not only a progressive motion, but will turn round in vinegar, and will stir more briskly and longer than any other stone that vinegar has the like effect upon; and though it has been steeped therein for three or four days, yet when fresh is poured upon it, it will still emit a great many little bubbles as at first from underneath it, and at the instant it begins to move. It once happened, that when vinegar was not at hand, another fluid was made use of by a chemist,

chemist, which caused the stone to emit such a quantity of effluvia, that they ascended in a cloud to the surface of the menstruum, where they settled exactly in the form of the stone, and that not only of a single joint, but of a whole column.

Linnaeus places the LAPIS JUDAICUS, or Jews Stone, among petrifications; and *Boet* informs us that it is in the shape of an olive, and is roundish, tender, and brittle, with streaks that run according to the length, and placed at equal distances, as if they were done by art. The colour is whitish, or a faint ash colour, shining within, and it may be obliquely cloven into foliaceous plates. It is called a *Jews Stone* because it has been found in *Judæa*, and other parts of *Syria*; but some of these have been found in *England*, particularly in *Oxfordshire*, which are of a more slender and longer shape than any sort of olive. Some are about two inches in length, and an inch and a half in circumference; but others have been met with less than an inch long, and not much above half an inch round. Most of them have a kind of pedicle or stalk, from which they seem to have had their growth; and there are ridges or furrows through the whole length of the stone. The ridges are marked with small knots set in the order of a quincunx, that is, in four points placed in a square, and a fifth in the middle. Their texture is very curious, for they consist of thin plates as above, not unlike the selenites, only they are opaque.

They have formerly been accounted excellent against the stone, and were said to diminish or break it in pieces; but now no such properties are acknowledged. They might perhaps have occasioned gravel to come away, which has been taken for bits of stones. Not only these, but coral, the belemnites, crabs eyes, and the like, consisting of fixed earthy particles, may unite with the salts in the fluids of a human body, and by that means render them unfit for passing through the pores of the skin; and then it is no wonder they should rush towards the kidneys, and seek for an exit that way, and afterwards be excreted in the form of
large.

large gravel. The dose of one of these stones in powder was a dram in a proper vehicle.

Linnaeus likewise places CORAL, Madrepore, and the like, among petrifications; and he calls them Lithophytes, though they have been commonly placed among sea plants. Those of the Coral kind are a little flexible, like wood, when in the water, and to a small degree when out of it; but they may be reduced into powder like chalk. There are a great many of this kind, and they resemble small trees without leaves: others are in the form of a net, sometimes with large meshes, and sometimes with small. The inside of the branches seems to be of the nature of horn, for it has the same smell when put into the fire; but the bark is of a stony nature, and contains a great deal of salt. Coral, properly so called, is of a stony nature, and is placed in the animal kingdom because it produces sea insects. Some of these are red, and others white; and we are told that near the Island of *Amboyna* there is one found that is black, which the *Indians* call Acaburum. *Boet* informs us that some sort of Corals, besides those already mentioned, are green, yellowish, ash-coloured, and brown; and that others are variegated with divers colours. However, the red of the colour of vermillion is best, and is by some said to be of the male kind, and that which is palish of the female. The white Coral is the next in value, and then black; but those of other colours some will not allow to be Corals, though they are found in the same places. It is always covered with a bark, and is stony, solid, and very hard, even in the water; though the branches are a little flexible, but soon grow hard in the air. The bark of Coral is a mixture of tartar and a fluid of a gluey nature; and though it is a little rough, it takes a very fine polish. Some take the black Coral to be a sea plant of a different nature.

Red Coral is not of so great esteem in *Europe* as it is in *Asia*, and particularly in *Arabia*. It is used for making several sorts of toys, such as spoons, heads of canes, knife-handles, sword-hilts, beads; and, when set in silver, it serves as a play-thing for children, and

is designed to rub their gums therewith, that they may breed their teeth more easily. The *Mahometans* of *Arabia Felix* use them for chaplets like the *Roman Catholics*, and number their prayers therewith; besides, they seldom bury any person without tying one about their necks.

On the young branches of Coral there are found small eminences, pierced in the form of stars, and full of a milky fluid when they are just taken out of the water. Within these stars the Count *Demerfilli* asserts to have seen flowers proceed, which retire within when taken out of the water. Many learned men have thought sea plants to be nothing but petrifications, consisting of plates of salt, and layers of tartar, placed one upon another; and as coral always grows with its head downwards, in caverns of rocks in the sea, the situation has caused them to suspect that they were nothing else but petrifications, like those found on the roofs of certain caves in the rocks. But since the discovery of the flowers of coral and some other marine productions, it is not at all doubted but they have a regular organization; and if their seeds have not yet been perceived, it is because their smallness renders them imperceptible.

But some have thought that the generation of these plants is not owing to the seeds, because as they always hang with their head downwards, they would fall off to the bottoms of the caverns, and not place themselves on the top; but this difficulty may be removed by supposing they are lighter than the sea water, and that the milk which surrounds them is of so thick a nature, that it may help to assist them in swimming. Hence indeed it may happen that many of them may rise to the top of the water, and there perish; but then likewise others may ascend to the top of the caverns, and there fix themselves, and then they will grow like the coral from which they proceed. Hence we may conclude, from the regularity of these productions, the organization of their parts, the great numbers of small pores in their bark to receive the bitumen and other sea juices, the eminences regularly hollowed in the form of stars, which serve for the

cases of flowers in the same shape, the vessels full of a milky fluid which is found between the bark and the body of the plant, to make it grow thicker by little and little, and the perpetual uniformity of the same circumstances; I say from all these particularities we have reason to believe that the bottom of the sea is covered with plants, with characteristics different from ours. In *Spain* they have a particular sort of a machine for the getting of Coral, particularly at a promontory in *Catalonia*. This is a wooden cross which is very large, and in the centre there is a wooden ball of a great weight, to which a very long and thick rope is fastened. At each end of the cross they hang a net in the form of a bag, which being let down into the sea, there are divers proper persons that know where the Coral is to be found, and they have the care of managing the rope. They guide one or more ends of the cross into the caverns, and then the nets lay hold of the Coral, break it off, and let it fall into the hollow part of the net; and when they have got as much as can well be contained in each of them, the machine is drawn up. The Red Coral is only chosen for medicinal uses, and many authors have ascribed great virtues thereto, which are in a great measure imaginary; however, it cannot be denied that it is a good absorbent, and therefore is proper to restrain the orgasm of the blood, and to blunt the acrimony of the bile and other humours in various sorts of fluxes, as well as for the gripes in children. Its dose is from a scruple to a dram.

The MADREPORE has no bark like the former, but it is branched like it, though the branches are not so numerous. There are several sorts of them, and some are only a thick plate of a hardish stony matter, pierced with a great number of holes or pores, which are disposed in the form of small pipes, waves, stars, and other figures; but it is most commonly in the shape of a small tree, and the branches are always full of holes or pores. It is found in various parts of the world, but no where in such great plenty as near the *Caribbee* islands.

There

There are several sorts of them, as the stellated Madre-pore akin to Coral; the branched Madre-pore akin to Coral; the Madre-pore or Millepore of *Tournefort*; the common Madre-pore or fistulous white Coral; the Madre-pore like southernwood; the warty-pointed Madre-pore, by some called the water-pointed white Coral; and the white stellated Madre-pore.

Though Madre-pore is generally found growing in the sea, yet it is sometimes found on the tops of mountains: that met with by *Jussieu* on Mount *Chau-mont* in *Normandy* was porous, light, white, and in all respects like the common Madre-pore. It is, like most petrifications, alkaline and absorbent, and has much the same virtues as Coral. In fluxes of the belly the dose is from half a scruple to two scruples.



C H A P. XXXV.

*Of the VITRESCENT and CALCARIOUS STONES,
and those that will not strike fire with Steel.*

IN the foregoing part of this treatise relating to sands, clays, pebbles, flints, and the like, I have kept a system constantly in view, written by a gentleman who, according to the preface to the supplement to *Chambers*, has distinguished himself in natural history, and who by the best judges is allowed to understand the subject extremely well. But lest any thing should be wanting, it will not be improper to add what *Linnaeus* has published relating to the STONY KINGDOM, as he calls it. He divides it into three classes,

I. SIMPLE STONES, whose constituent particles are homogeneous, or of the same nature. II. MINERALS or COMPOUNDED STONES, whose constituent particles are heterogeneous; that is, stones which are imbued with a foreign principle, namely, salt, sulphur or metal. III. FOSSILS or AGGREGATED STONES.

1. SIMPLE STONES are those that are vitrescent, that is, that will turn into glass in the fire; that will

strike

strike fire with steel, but will not dissolve in aqua fortis. 2. CALCARIOUS STONES, that are rasile, that will not strike fire with steel, that will calcine to a powder in the fire, and will generally dissolve in aqua fortis. 3. APYRI, that may be cut, but will not strike fire with steel, nor dissolve in aqua fortis.

VITRESCENT STONES are the Cos, the Quartz, and the Silex. The COS consists of subopaque indeterminate fragments, and of no certain shape, with granulated particles. 1. The brittle Cos or Sand-stone consists of clay and sea-sand, is of a heavy colour, interspersed with impalpable shining particles. It will ferment with aqua fortis, but not dissolve therein; and it will hardly strike fire with steel. It is usually moist in the places where it is got, and it will cleave in remote, oblique, perpendicular, and horizontal chinks. It is used in the construction of forts, the foundations of houses, for chimnies, and for stone coffins. 2. The brittle Cos or Sand-stone with gritty particles, is composed of common sand, and is either red or white. It ferments but very little with aqua fortis, and emits very small sparks with steel. It will cleave at the horizontal chinks. It is used for whetstones and grindstones. 3. The solid Cos, with impalpable quartzous particles, is of a whitish flesh-colour interspersed. It will not ferment with aqua fortis, but it will strike fire very freely with steel. 4. The considerably solid Cos or Sand-stone, with transparent, sandy, quartzous particles that are all of the same size. It is common every where, and is of the colour of glass. 5. The considerably solid Cos, with subopaque, nearly equal, sandy, quartzous particles, and which readily cleaves horizontally. It is used for the foundations of buildings. 6. The pretty solid horizontal Cos, with sandy quartzous unequal particles, is used for millstones. 7. The pretty solid horizontal Cos, with sandy particles, and a waved surface. It consists of nearly equal angular particles. 8. The indifferently solid Cos or filtering stone, that will let water pass gradually through it. It is brought from *Canary* and *Mexico*, and serves to depurate water, especially at sea.

QUARTZ

QUARTZ consists of indeterminate, transparent, angulated, solid, acute fragments. 1. Aqueous Quartz is found every where in the clefts of rocks, and proceeds from water detained therein. It is always parasitical, though often dispersed; and all Quartz strikes fire very freely with steel. 2. White Quartz is found among rocks, though not very frequently. It is generated of water and marble, and readily melts into glass. The fragments often look mealy, and it is in great request among workers in copper. 3. Coloured Quartz is generally found in or near mines, and proceeds from Quartz tinged with metalline particles. When tinged with lead it is yellow, and is called a Topaz. With iron it is red, and termed a Ruby; with iron and copper it is purple, and is an Amethyst; with copper blue, and then it is a Sapphire; with copper it is also green, and then it is an Emerald. 4. Opaque Quartz is found almost every where, among rocks and other places. 5. Quartz inclining to a whetstone consists of conglomerated grains like sea salt.

The SILEX consists of indeterminate somewhat transparent fragments, which are convex in some places, and concave in others. 1. The chalky Silex is the common flint stone, and is every where to be found among chalk, for which reason it is often covered with a chalky crust. It sometimes contains shells and other things. It is seldom tinged with metals, because the matrix is an absorbent of vitriol. It is used to strike fire with, to build walls, and to pave the streets. It is of a blackish horn colour, but sometimes pale and whitish. When flint is coloured and a little transparent, it is called an Agate, and is found differently coloured with a crust. When a little transparent and whitish, it is a Carneolus; when reddish it is a Sardus; when red a Beryl; when whitish with red specks, it is Stephen's Gem; when the colours change in different lights, it is an Opal; when it is greenish with rays, it is a Cat's-eye; when it is a little transparent and of a cloudy ash-colour, it is a Chalcedony; and when a little transparent and variegated with streaks, it is an Onyx. 2. The marble
chalky

chalky Silex consists of earthy chalk, harder, larger, more opaque, with fragments less convex than the former. 3. The marble rock Silex consists of somewhat transparent, a little scaly, softish, coloured fragments; and it fills the chinks or strata of rocks, but more especially marble. 4. The marly rock Silex is either white, ash-coloured, or red; and the red in particular is generated in ochreous indurated marl.

CALCARIOUS STONES are Marmor, Spate, and Schistus. MARMOR consists of indeterminate fragments, and when it is calcined, and water thrown thereon, it falls into powder. 1. Soluble Marmor with solid impalpable particles, consists of clay, and is properly a clayey stone coagulated with the vitriol of iron. It is yellowish, solid, and extremely hard; but it will dissolve in aqua fortis, and will strike fire a little with steel. It seems to be covered with a calcined white crust, and has often an angulated spatous vein, of a blood colour on the outside: it never constitutes a rock, and is sometimes made use of to pave highways, particularly that between *Paris* and *Brussels*. 2. Soluble Marmor consists of a heap of crusted globous grains, and is commonly called the Egg-stone. It seems to be made up of hail-stones less than crabs-eyes, all crowded together. 3. Soluble Marmor consisting of roundish fragments of a calcareous nature, which are red, unequal, dark and brittle. 4. Soluble Marmor consisting of horizontal fragments, which may be cloven, though not very easily. It consists of an horizontal rock placed upon a sandy rock, and is either red or whitish, and before rain is moist. It is used for pavements, and for grave-stones. 5. Soluble Marmor consisting of shining sandy particles that are somewhat solid, and of different colours. This is the limestone, and is turned into lime by calcination. 6. Soluble Marmor consisting of shining granulated particles of the spatous kind, and of several colours: this is also lime-stone, and is of great use to workers in metals. 7. Soluble Marmor consisting of radiated shining particles, that are oblong and in the shape of cups, of a whitish colour. 8. Soluble Marmor consisting of impalpable rasile particles, is the stone which

we

we call Marble. The particles are exceeding small, scarce to be distinguished by the naked eye, and are rasile with a knife. It is used in building, for ornaments and statues. It is of various kinds, as the white *Parian* Marble, the yellow *Phengites*; the green *Verdello*; the black *Lucillum*; the red *Numidian*; the ash-coloured *Venetian*; the spotted white *African*; the black *Canarian*; the green *Lacedemonian*; the purple *Lesbian*; the yellow *Porta-Sancta*; and that with various zones called the *Polyzonian* Marble. 9. Fixed Marmor with unlike particles is commonly called Gypsum, and consists of an ash-coloured opaque stone, interspersed with scales somewhat spatous, and that will not ferment with aqua fortis. This is generally known by the name of Plaster of *Paris*, and serves for a cement to make stucco, or small statues. 10. Fixed Marmor with perpendicular parallel filaments, consists of horizontal plates, in which the fibres are perpendicular, transverse, white, contiguous, parallel; and it will not ferment with aqua fortis. 11. Fixed Marmor consisting of sandy shining particles, or of shining impalpable white sand. It is now and then reddish or spotted, but it will never ferment with aqua fortis. It is used to make statues and many other things.

SPATE consists of rhomboidal shining fragments, and when burnt becomes a powder that will not effervesce with water. 1. Fissile Spate consists of fissile transparent ash-coloured fragments. 2. Compact sub-fissile Spate which is transparent, and when looked through makes the objects seem double. This is commonly called *Iceland Crystal*, because it is brought from the island of that name, as well as *Norway* and *Sweden*. 3. Compact transparent Spate, which does not double the objects, consists of small white watery yellowish cubico-rhomboidal fragments. 4. Compact sub-diaphanous Spate, consists of whitish or milk-coloured fragments, and it is found in the clefts of rocks in the same manner as quartz, for it is parasitical. 5. Compact sparkling Spate consists of a solid stone that will strike fire with steel; it receives its colour and hardness from iron, and therefore cannot be very properly called a stone. 6. Compact sub-opaque

Spate

Spate consisting of scaly fragments, which are unequal ash-coloured rhombi, and seem to be composed of membranes.

SCHISTUS consists of determinate fissile fragments, and is combustible in the fire. 1. Blueish black ringing Schistus is the slate that serves to cover houses, and consists of hard plates, that will sound almost like a metal. It will not imbibe water, break with frost, nor ferment with aqua fortis. It is used to cover all sorts of structures. 2. Black Schistus, that is white where wrote upon, consists of plain, fissile, hard, black, equal plates, and is used for tables, and for boys to cast up accounts thereon. 3. Blackish brittle Schistus, that is white where written upon, consists of brittle plates, that will ferment a little with aqua fortis. 4. Schistus that is red where written upon consists of a dusky, ash-coloured, red, or greenish brittle stone. 5. Schistus that is black where written upon, or rather serves to draw black lines, is commonly called Black Chalk; and it consists of brittle black plates, that will colour the fingers, and will ferment with acids. It is used as a sort of paint.

APYRI. MICA consists of shining, scaly, plain particles. 1. The Mica with membranaceous, fissile, transparent particles, consists of exceeding thin and very broad membranes, of the colour of glass and transparent; and it will also bend without breaking. This is commonly called Isinglass, and is used in *Russia* for windows. 2. The Mica with membranaceous transparent particles consists of fissile membranes, scarce a palm in breadth; which are a little flexible, and of the colour and transparency of horn. 3. The Mica consisting of scaly interspersed particles is made up of exceeding minute ones, which are often black, and when burnt turn to a shining gold colour. 4. The Mica with subprismatic particles, that cross each other, consists of a black rasile stone, with the impalpable particles interspersed with some that are larger, oblong, smooth, and subprismatic. When burnt it is of a shining gold colour, like the former. 5. The Mica with lamellated particles, streaked at acute angles, is called by some yellow brittle Talc with opaque plates. It consists

consists of plates or scales an inch broad, which are fissile, brittle, of a gold colour, and streaked at acute angles, which scarce meet at the points.

TALC consists of obscure heavy particles, every where united. 1. Talc with impalpable, transparent, softish, convex, fissile particles, is the common Talc of the shops, and is brought from *Venice*. It consists of soft, fatty, convex, almost transparent, whitish green plates, and may be broken like suet. It is used only as a cosmetic. 2. Talc with impalpable particles is solid and black, with a black smooth surface. It is to be met with every where in mines, and consists of a thick solid stone, a little rasile, with a surface that feels as if it was smeared with oil. 3. Talc with impalpable particles, that is solid and spotted with green, is called by some the Serpent-Stone. It is used for making of vessels, because it will admit of a tolerable polish. 4. Talc with impalpable particles, and parallel plates, is found in the mines of *Sweden*. 5. Talc with impalpable particles, and membranes that will readily bend, is met with at *Falun*. 6. Talc with impalpable particles, and oblong, convex, opaque, flesh-coloured plates. It consists of plates like those of common Talc, which are soluble, but thick, rough, of a flesh colour, and fissile. When burnt it cleaves like isinglass. 7. Talc with branny, interspersed, brittle, opaque, greenish particles. The interspersed particles are branny, and this stone when wet is always green. It is used to make vessels, as well as for chimneys and the foundations of houses. 8. Talc with interspersed branny subdiaphanous particles, that will foul the fingers. It is called by some the solid semi-transparent Talc of painters, and in *Sweden* Taylors Chalk. It is a very soft and somewhat transparent stone, that looks like suet. 9. Talc with branny interspersed, rigid, opaque particles, and by some authors called Asbestus, is found in several mines. 10. Talc with rigid, fasciculated, crooked fibres, is another kind of Asbestus. It is a very hard stone, with tophous fibres variously interwoven, like the knots of the birch-tree.

AMIANBUS has longitudinal fibres. 1. Amiantus with flexible thread-like fibres i. commonly called Incombustible Flax, and is found in *Lapland* and *Siberia*. It may be used to make linen, paper, and the wicks of lamps. 2. Amiantus with angulated, rigid, opaque fibres, consists of angulated hard cohering fibres, that imitate wood. It is called by some Asbestos, with parallel hard fibres, that will not separate. 3. Amiantus with brittle transparent fibres. It consists of rigid fibres that will separate, but are as brittle as glass, somewhat transparent, and of a greenish colour. 4. Amiantus with soft downy fibres is the Plumous Alum of the shops, but improperly.

ASBESTUS has interwoven light fibres. 1. Asbestos that is fissile and somewhat solid is called in *Sweden* Mountain Flesh, and consists of a fissile, pale, ponderous stone, that will not swim in water. 2. Membranaceous flexible Asbestos, called by some Mountain Leather, consists of a stone with interwoven fibres, like old leather. It will swim upon water, and has a hard, smooth, white surface. 3. Somewhat solid flexible Asbestos is called in *Sweden* Mountain Cork, and is a light stone, with a surface like the inner bark of the cork-tree. It will swim in water.



C H A P. XXXVI.

Of MINERALS, or COMPOUNDED STONES.

MINERALS are, 1. **SALTS** simply composed, soluble in water, with a certain pungent taste, and forming crystals of many sides. 2. **Decomposit SULPHURS**, that are soluble in fire, and that send forth fumes with a strong smell. 3. **MERCURIALS**, that yield a regulus in fire, which is convex, opaque, shining, and coloured.

SALTS. **NATRUM** consists of octaedral crystals, with a tetraedral column, having sides alternately narrower, and the apices internally like wedges. It will

hiss in the fire, and has a bitterish taste. 1. The Natrum of marble is commonly called Calcarious Salt, and is generally found in calcarious rocks. 2. The Natrum of walls is known by the name of Aphronitrum, and is found on old walls, especially in vaults. 3. The Natrum of fountains is of the same kind as our *Epsom* salt, and is called the Purging Salt in the shops. 4. Spatous Natrum is of several sorts; as the Natrum with erect, interspersed, white, subdiaphanous crystals; the Natrum with decumbent, interspersed, transparent crystals; the Natrum with decumbent, parallel, flesh-coloured, opaque crystals; the Natrum with somewhat erect, parallel, whitish crystals; and the Natrum with vertical, parallel, glassy crystals. It is found in several places, but principally in *Germany*, and consists of a spatous crystallized stone, whose crystal is a tetraedral column, with all the four sides consisting of oblong pentagons, whose opposite sides respect each other's apex. Each apex consists of two tetraedral planes, which are alternate among themselves. It may be objected, that crystal is stony, and not a salt; but it contains salt, whose figure it bears; for all crystallizations proceed from salt.

The SELENITES consists of rhombous decaedral crystals, with two broader sides opposite to each other.

1. The spatous, gypseous, rhombous Selenites is crystallized gypsum, of a rhomboidal figure, and is found between the plates of schistus. The crystal consists of two broad rhombi, four narrower, and four tetraedral, whose outward angles are alternately nearer each other. They resemble the fragments of spate, and, like gypsum, will not ferment with aqua fortis, as all those of the like kind will. When it is reduced to powder and mixed with water, it will crystallize again. 2. The spatoso-gypseous prismatic Selenites is found between the schistus of the rocks, and consists of a crystal with a hexaedral column, and two opposite sides that are broader. The rhombous fragments are spatous at the middle longitudinal line, with convergent apices: hence, when it is cloven, the crystal is streaked as it were at the angle. 3. The spatoso-gypseous wedge-like Selenites is the transparent gypsum

Whetstone
319



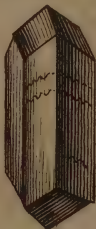
Iron Colour'd Ball 319



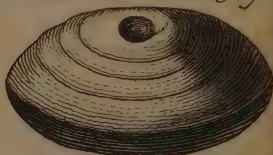
Hippocrates's Sleeve 319



Sclerites 338



Button Stone 319

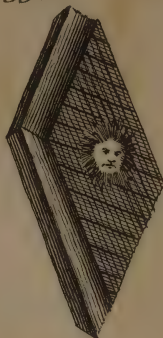


Star Stone

322



Selenites 338



Selenites 338

Star Stone

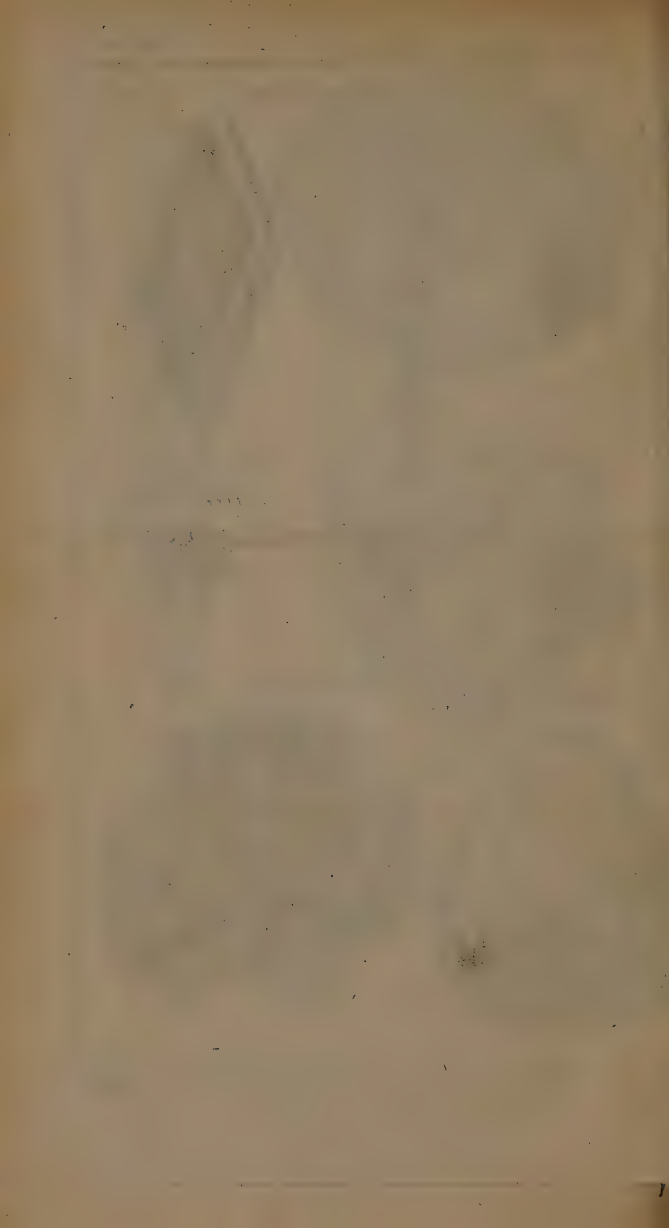
322



Cap Stone 319

Astroites 324.





sum with rhomboidal plates, and is found in the mines of plaster of *Paris*. It consists of a stone that will cleave into exceeding thin transparent plates.

NITRUM consists of octaedral crystals, with a prismatic hexaedral column, terminated at both ends with a hexagon pyramid. It will hiss in the fire, and flash with a phlogiston; and it has a cold acrid taste.

1. Ground Nitrum is the common salt-petre, and is found every where among old buildings. It consists of parallelograms with six long rectangles, that conclude the prismatic column, and have six triangles concurring at the extremity of the pyramid in a point.

2. The quartzous aqueous Nitrum is of several sorts, as the quartzous Nitrum sharp at both ends, called by some Mountain Crystal accumulated at both ends; the quartzous Nitrum with oblong distant crystals; the quartzous Nitrum with aggregated crystals without a column; and the quartzous, aggregated, fistulous Nitrum. They are found every where in the cavities of stones.

3. The quartzous coloured Nitrum, of which the yellow is a topaz, the brown a jacinth, the red a ruby, the purple an amethyst, the blue a sapphire, the blue-green a beryl, the green an emerald, and the black a morion. It is found in or near mines of metal.

4. Spatous Nitrum is of different sorts; as, the spatous Nitrum with equal pyramids, and without a column; the spatous Nitrum pyramidal at each end, and without a column, but the upper pyramid is subulated; the aggregated spatous Nitrum, without a column, with a subulated oblique pyramid, called by some the hexangular crystallized Spate; the aggregated spatous Nitrum without a column, and which is fasciculated and decumbent; the plain spatous Nitrum imbricated three ways; the spatous Nitrum that is plain and truncated at both ends, and is a roundish hexaedron; the spatous Nitrum truncated at both ends, called by some a crystallized, prismatic, hexangular Spate; the spatous, triangular, truncated Nitrum, with all the angles plain; the solitary spatous Nitrum, in the form of a stone in fruit; the aggregated, three ways imbricated, streaked, spatous Nitrum; and the aggregated, imbricated, hemispherical,

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rical, spatous Nitrum. They are all found in the
mines of *Germany*.

MURIA consists of cubic hexaedral crystals, which crackle in the fire, and have a pungent taste. 1. Marine Muria or sea salt is found in several places near the sea, especially in hot countries. 2. Fountain Muria is the salt that is got out of salt springs. 3. The fossile Muria is the sal gem of the shops, and is found in *Poland* and *Hungary*. 4. The spatous rhombous Muria consists of rhombous crystals, in the shape of the particles of spate. 5. The stony Muria, that is like a phosphorus, called by some the shining Spate, and by others the solid Spate, more or less transparent, with particles not to be distinguished from each other. There are several sorts of this; as, the aggregated white spatous Muria; the yellow aggregated spatous Muria; the purple aggregated spatous Muria; and the green aggregated spatous Muria. It is found in several parts of *Europe*, and consists of a transparent, solid, rasile stone, that will not ferment with acids; but it will crackle and bounce in the fire, turn into glass, and being heated will shine like a phosphorus. In some mines it has no crystalline figure when it is old, for then it loses it. 6. The Muria of stones, consisting of isinglass and spate, is called by some the nitrous Stone melting in the air. It consists of a stone compounded of yellow spate and a mica, that will melt about noon.

ALUMEN has octaedral crystals, and will melt, froth, and ferment in the fire: it has also an astringent taste. 1. Naked Alumen is the plumous Alum of the shops, and effloresces out of a stony rock. 2. Schistous Alumen is called by some mineralized fissile stone Alum. It has saline octaedral crystals, with eight plane triangles; but the vertical angles are terminated with a rhombous plane, and the transverse angles have an oblong plane quadrangle. 3. Reddish marble Alumen is a mineralized Alum from a calcarious stone, and is the Roach Alum or *Roman Alum* of the shops. 4. The talcous opaque Alumen consists of an octaedral tessera, with sides consisting of eight plane equal triangles. It is of a brownish ash-colour, opaque and rasile,

rafile, and is found in *Sweden*. 5. The transparent, spatous, rafile Alumen is found in *Germany*. 6. The stony, transparent, extremely solid Alumen is of several kinds; as, the spatous Alumen with an equal tessera, which is a most transparent gem, extremely hard, of the colour of water, and is the true diamond; the extremely transparent gem, which is next to a diamond in hardness, is of a red colour that will not change in the fire, and is a ruby; the exceedingly transparent gem, the third in hardness, is of a blue colour, which is destroyed in the fire, and is a sapphire.

VITRIOLUM consists of many-sided crystals imbedded with metal. It will melt and calcine in the fire, and has a styptic taste. 1. Vitriolum of iron is green and cubical, and is the Vitriol of *Mars* in the shops. It is found every where in iron mines, and where the earth is of the nature of pyrites. It consists of a cubical saline crystal. 2. The blue Vitriolum of copper, with twelve sides, is the *Cyprian* Vitriol of the shops, and is brought from *Cyprus*, where it is prepared. It consists of a saline, dodecaedral, rhomboidal, depressed crystal. 3. Vitriolum of copper and iron is of a greenish blue colour, and is stalactitious. It is by some called the *Hermaphrodite* Vitriol, and is found at *Falun*, where it hangs from the roofs like icicles. 4. White oblong Vitriolum of zinc; it consists of oblong crystals, which approach a little to the shape of natrum.

SULPHURA. ELECTRUM emits a sweet smell, and is of a brownish colour. 1. Opaque tenuous Electrum is by some called *Variegated Amber*; and there is also another without variegations, which is of a citrine brown or black. It is found in the sea, especially in the *East Indies*, where it swims upon the water, and is of the consistence of wax, with a very strong sweet smell. It is used as a perfume, and in medicine; and is an aphrodisiac and analeptic; but it is extremely dear. 2. Transparent solid Electrum is by some called *Transparent Amber*; which is either white, yellow, or brown. There is another that is opaque, and either yellow or brown. It is found chiefly in the *Baltic Sea*, where it is thrown upon the

shores, particularly of *Prussia*. It consists of a transparent, yellowish, solid mass, and is the common Amber known by every one. It is used to make vessels, cane-heads, and the like; and in the shops there are various preparations of it, such as the volatile salt, tincture, and oil.

BITUMEN has a disagreeable smell, and is of various colours. 1. Fluid whitish Bitumen, commonly called Naphtha, is found in *Persia* and *Egypt*, and is the Magnet of fire. 2. Liquid brown Bitumen is the fluid, thick, dark brown Bitumen of other authors, and in the shops is called Petroleum. It is found in *Dalecarlia* and many other places, and consists of a rude ash-coloured marble variegated with red; or it is the marmoreous Ætile, with crystalline fixed embryos, as at *Skierback*, where it is found. 3. Tenacious black Bitumen, commonly called Maltha, is found at *Dannemore*, and in various iron mines among the crystals. 4. Brittleish black Bitumen is the solid coagulated Bitumen of other authors, and is commonly called Asphaltum. It is found in *Oeland* and other places, between the plates of schistus, like a honeycomb. 5. Marshy ground Bitumen, according to some, is a mineralized earth, and is called Ampelites. It is found in *Switzerland*, and is used instead of pit-coal and turf. 6. Bitumen of schistus is the same as pit-coal, and is a Bitumen consisting of a fissile mineralized stone. The Greek name is Lithanthrax. It is found in almost every country, especially in *Europe*, and is used as fuel for fires. 7. The fetid Bitumen of marmor is the opaque spate, which emits a bad smell when rubbed, according to some authors. It is called the Hogstone in *Sweden*, where it is found, upon marble, but below the upper schist. It consists of a somewhat solid, fetid, scaly rock, or of crystals that lie close to each other.

PYRITES has a pungent smell, a yellow colour, and a saltish taste. 1. The naked transparent Pyrites is the Sulphur vivum of the shops, and is found in *Russia*. 2. The almost naked, arsenical, micaceous Pyrites is, according to some, an arsenic consisting of sulphur and a spatous micaceous stone. It is the Orpiment

piment of the shops, and is brought from *Venice*.

3. The crystallized Pyrites, according to some, is a mineralized sulphur with iron, and in a crystalline form. It is of various figures, as tetraedral, consisting of triangles; hexaedral, consisting of quadrangles; octaedral, consisting of triangles, but is seldom found entire; dodecaedral, consisting of quinquangles, and often containing silver; hemispherical, containing arsenic, iron and copper; and globous, containing arsenic with copper. It is found in various mines, where it is very common. 4. The iron sparkling Pyrites of an uncertain form, according to some, is a mineralized sulphur with iron. It is found in various mines, and consists of a pale Pyrites of an uncertain form, and will give fire very freely with steel. 5. The ferreo-cupreous Pyrites, with a melting matrix, is, according to some, a copper mineralized with sulphur and iron. It is of various colours, as livid, of the colour of liver, yellow, tawny, of a yellowish green, and with ochreous holes. It is found in the copper mines of *Sweden*. 6. The ferreo-cupreous Pyrites, with a vitrescent matrix, is either quartzous or cotaceous, and is found in the same places as the former. 7. The ferreo-cupreous Pyrites, with an apyrous matrix; of which there is the micaceous, the fissile talcous, and the talcofo-acerous. It is found in the same places as the two former.

ARSENICUM has the smell of garlick, and is of a white colour, with a sweetish taste. 1. Naked white Arsenicum is by some called the simple native Arsenic, and is commonly known by the name of white Arsenic. It is found in *Germany*. 2. Naked reddish Arsenicum is treated of by authors by the name of Realgar and Sandarach. It is found in *Sweden*, *Germany*, and *Turky*. 3. Crystallized Arsenicum is found in *Germany*, and consists of octaedral brown crystals imbuted with iron. 4. White Arsenicum with plain fragments is commonly called the white Pyrites, and is found in several parts of *Sweden*. 5. White Arsenicum with convex fragments is a testaceous Arsenic mineralized with iron, and is found in *Helsingia*. 6. The reddish cupreous Arsenicum is an Arsenic mi-

neralized with sulphur and copper, and is of the colour of red copper. It is found in *Germany*. 7. The blueish ash-coloured shining Arsenicum is an Arsenic mineralized with iron, and has shining grains of blueish ash-colour. 8. Lenticular Arsenicum of black schistus, consists of a large black, extremely solid, very hard body, of a lenticular form generally, and seems as though it was turned in a lathe, and in the open air it will melt on the ground. It is found in alum mines.

MERCURIALIA. HYDRARGYRUM consists of a white metal which is always fluid, and will fly away in the fire before it is red hot; when dissolved in aqua fortis it is whitish. 1. Naked Hydrargyrum is the common quicksilver, and is found in *Hungary*. 2. Red arsenical Hydrargyrum is *Japan* Cinnabar, and is found in *Japan*. 3. Pyrititious red Hydrargyrum is the native Cinnabar of the shops, and is found in *Hungary*, *Bohemia*, and *Istria*. 4. Petrous Hydrargyrum is found in schist, talc, ore of lead, and quartz.

STIBIUM is streaked, brittle, and has white metalline particles; it flies away in the fire, after it is red hot; when turned to glass it is purple, but being dissolved in aqua regia it is yellow. 1. Stibium interspersed with capillary fibres, is antimony mineralized with a great quantity of sulphur, and has the capillary fibres separated like wool. It is found in *France*. 2. Streaked Stibium is streaked antimony mineralized with sulphur; it is found in *Dalecarlia*. 3. Crystalline Stibium is antimony mineralized and crystallized with sulphur; it is found in *Germany*. 4. Spatous Stibium, with fibres that cross each other; it is found in *Germany*, where the fibres are between the transverse and perpendicular plates of spate. 5. Red Stibium is red antimony mineralized with sulphur and arsenic, and is found in *Germany*.

BISMUTH has metalline particles, is brittle, tessellated, and of a yellowish white colour; it will melt in the fire before it grows red hot, and turns to a brown or blueish glass; when dissolved in aqua fortis it is red, but in aqua regia yellow. 1. Naked Bismuth is the native, cohering with thin plates, and

is found in *Germany*. 2. The whitish yellow shining Bismuth is mineralized with arsenic, sulphur, and cobalt; it effloresces with a variegated yellowish colour, and is found in *Helsingia*. 3. Shining Bismuth with blueish grains is a cobalt mineralized with arsenic, and has shining grains of a lead colour. It is the ore of cobalt, and is found in *Helsingia*. This sort turns to a blueish glass.

ZINC has metalline particles, and is of a blueish white colour, and is malleable. It will melt in the fire before it is red hot, and will emit a yellowish green flame with a floccous smoke. When dissolved in aqua fortis it is white, but in aqua regia yellow.

1. Hoary Zinc intermixed with galena is mineralized with sulphur, and lead or iron, and is of a dark colour with shining particles. It is found in *Sweden*, and is an ash-coloured stone, resembling weisgolden, but is more heavy and opaque; it is intermixed with galena, and covered with yellow ochre. 2. Micaceous subteffulated black Zinc is mineralized with sulphur, arsenic, and iron, and the ore is dark and somewhat shining, with a sort of scales; it is found in *Sweden*, and in several sorts of mines. 3. Micaceous reddish Zinc that colours the fingers is mineralized with arsenic and iron, and the whole is either red, or is found in a reddish powder. It is called the reddish Galena, and is found at *Salzburg*. 4. Earthy Zinc has an earthy ore, of a yellowish or brownish colour. It is the Lapis calaminaris of the shops, and is found in *Poland* and *Hungary*.

FERRUM is a whitish ash-coloured metal, extremely hard, malleable, and sparkling. It will not melt in the fire till a long time after it is red hot, and will turn to a green glass, but when dissolved in aqua fortis it is brown. 1. Intractable crystallized Ferrum is found in various iron mines, though seldom; it consists of octaedral triangular crystals, resembling pure iron; but they are intractable, or are not to be attracted by the loadstone. 2. Intractable Ferrum with shining plates streaked transversely. It consists of shining, pure, remote, transversely streaked, and transversely oblique broken plates, that a loadstone will hardly attract. 3.

Intractable Ferrum with cubic shining particles, is the blackish tessellated ore of iron, and is found in *Lapland*. It consists of cubic shining particles of a silver or liver colour. 4. Intractable Ferrum with plain central white fibres is iron mineralized with arsenic, and the ore is black or brown, but when rubbed is reddish. It is found in *Germany*. 5. Intractable Ferrum with red central fibres is mineralized iron, and the ore is red or reddish when rubbed. It is the *Hæmatites* or Blood-stone of the shops, and is found in *England* and *Germany*. Intractable red Ferrum with impalpable points, consists of a red heavy stone with shining impalpable points, and is found in *Cumberland*. 7. Intractable shining micaceous Ferrum, is iron mineralized with arsenic, and the ore is red and micaceous, or reddish when rubbed. 8. Intractable brown Ferrum that colours the fingers, with micaceous streaked particles, is mineralized iron, and the ore fouls the fingers like soot; and it consists of convergent interspersed streaked particles. It is the *Magnesia* of the shops, and is found in *Germany*. 9. Intractable brownish ash-coloured Ferrum with shining points, is iron impregnated with arsenic, and is found in *Sweden*. It consists of a stone that smoaks in the fire like arsenic. 10. Intractable spatous whitish Ferrum is the white ore of iron, and is found in *Germany*. 11. Intractable scaly streaked Ferrum is mineralized with iron, and is a very hard rapacious solid ore, of a brown or iron colour, that will not be attracted by the loadstone. It is the *Smiris* or emery of the shops, and is found in the southern parts of *Europe*. 12. Attractory Ferrum, or the stone that will attract iron, is a mineralized iron, which serves to shew the poles of the world. It is the *Magnes* or Loadstone of the shops. 13. Retractory solid Ferrum. By retractory is meant the Ferrum that the loadstone will attract. It consists of a solid equal black ore, interspersed here and there with shining spots looking like water. 14. Retractory Ferrum with impalpable particles. 15. Retractory Ferrum with sandy particles consists of a heavy ore, with particles a little shining, in the form of sand. 16. Retractory Ferrum with angulated particles.

ticles. 17. Retractory Ferrum with scaly particles, is a squamous blueish ore of iron, or rather blackish with shining scales, and it is often cotaceo-quartzous and fissile. 18. Retractory Ferrum consisting of solidish particles, somewhat in the form of plates, is by some called the blueish lamellous ore of iron, and it consists of a blueish compact heavy ore, made up as it were of scaly plates. 19. Retractory talco-micaceous Ferrum. 20. Retractory Ferrum of marmor consists of somewhat solid ore, of very minute particles found in a calcarious matrix, which is often greenish. 21. Retractory pyrititious Ferrum is iron impregnated with pyrites, and consists of an ore often interspersed with pyrites, which while it is burning will smok like sulphur.

CUPRUM is a white, malleable, elastic, tenacious, sonorous metal, which will melt in the fire soon after it is red hot, and emit a blueish green flame; it will turn to a green glass, and when dissolved in aqua fortis is blue, but in aqua regia yellow. 1. Naked unformed Cuprum is native, granulated, foliaceous, dendroidal, botryoidal, capillary, superficial copper. It is found in *Smoland* in a spataceous matrix. 2. Naked crystallized Cuprum consists of an octaedral crystal like alum. 3. Precipitated Cuprum is pure copper, or precipitated out of a solution of vitriol, and is found at *Falun* in iron. 4. Ash-coloured Cuprum is copper mixed with silver and arsenic, or, as others term it, copper mineralized with arsenic, iron and silver, and the ore is whitish. However, there are varieties, for some are yellowish, some of a dark colour, and some of an ash colour, according to the prevalence of the mixture of the different metals. 5. Purplish Cuprum is by some called Violet Cuprum, and by others mineralized copper, whose ore is brittle and shines when broken. 6. Blue copper, by some called the Gold of marmor, which is shining and spotted with blue; and by others the Jasper, of a blue colour, and mixed with another. One sort is the Lapis Lazuli, variegated with blue and white; the other is the *Armenian* stone, variegated with blue and copper. It is a blue hard stone, always imbuted with copper, and often with gold;

gold; it is also often interspersed with cubic, transparent, white crystals, that will not ferment with aqua fortis. 7. Green Cuprum is commonly called Malachites, and is found in *Germany*. 8. Pyrititious brown Cuprum is copper mineralized with sulphur and iron, and the ore is of a gold colour, or variegated and shining therewith. It consists of a pyrita, saturated with yellow. 9. Cuprum of schist is the ore of copper found in a figured fissile stone, and is common in *Germany*. 10. Cuprum of the cos is cotaceous granulated copper. It is found in *Germany*, and consists of copper in a cos, streaked with the ochre of copper, at the same time covered with the rust of iron.

PLUMBUM is a metal of a blueish white colour, that is malleable, flexible, tenacious, and will not yield any sound. It will melt in the fire before it is red hot, will turn to yellow glass, and in aqua fortis is of an aqueous colour. 1. Naked Plumbum is native lead, and is found in *Germany*. 2. Plumbum that is somewhat malleable, is lead mineralized with sulphur and arsenic, and the ore is fat and almost malleable; it is found in *Germany*. 3. The spatous Plumbum of nitre, truncated at both ends, is lead mineralized with arsenic, and the ore is white or grey in the form of spate. There is another lead mineralized with arsenic, whose ore is solid, crystallized, and green. It consists of spatous crystals that are like hexædral prisms truncated at both ends, and often transparent; it is either of an ochreous or green colour, and very heavy. This sort of lead is always without silver. 4. Plumbum consisting of cubic particles, is lead mineralized with sulphur and silver, and the ore consists of lesser and greater tessulæ, or has shining grains. There are three sorts of it, called the Galena with greater distinct cubic fragments, the Galena with lesser distinct cubic fragments, and the Galena with shining fragments in a determinate situation. It is found in marble. 5. The unformed Plumbum with occult particles is lead mineralized with galenic ore, insensibly intermixed with stone, and of a variegated colour. It consists of a calcarious stone, whose mineral particles are hard to be perceived; but here and there

shining

shining particles are to be seen, which show that it is akin to the former.

STANNUM is a white, malleable, flexible, very light, tenacious metal, that will yield a sound. It will melt in the fire before it is red hot, will turn to yellow glass, and in the solution of aqua regia it is yellow. 1. Stannum with pyramidal irregular black crystals, is called by some irregular black Tin with many sides, and by others Tin mineralized with iron and arsenic; the ore is crystallized with many sides, and is of various colours. It is found in *Cornwall* and *Sweden*, and consists of a crystal of a tessellated shape, hard to be described. In *Persberg* where it is smallest, it consists of twelve plain triangles, and is of the shape of nitre without a column; but in each pyramid two opposite sides are broadest, hence it makes a wedge-like tessula with the apex, and so may be easily distinguished from iron. 2. Stannum with black columnar crystals consists of a long column of crystal, with straight and often streaked sides, for which reason the shape is hard to be described. 3. Stannum with reddish tessellated crystals is called the purplish regular Tin with many sides by some, but by others a gem more or less transparent, of the eighth degree of hardness, and of a darkish red colour; and if it continues long in the fire it will melt. There are three sorts, called the dodecaedral Granite consisting of plain pentagons; the dodecaedral Granite consisting of rhombi; the equal-sided tesseraedral Granite consisting of rhombi. The last is common among the rocks of *Lapland*, in a micaceous stone; but the first is rare, and the second is seldom found. 4. Unformed reddish black Stannum is tin mineralized with iron and arsenic, and the ore is irregular, consisting of the lesser mineral crystals of tin and stone; it is found in *Cornwall*. 5. Stannum of stone is tin mineralized with iron and arsenic, and the ore is like a simple stone. It is found in *England* and *Sweden*. 6. Stannum of spate, called by some spataceous stone imbued with tin, is found in *Bohemia*; it consists of a white heavy spate.

ARGENTUM is a white, malleable, tenacious, sonorous metal, which will melt in the fire when it is glowing hot; it yields a purple-coloured glass, and is white when dissolved in aqua fortis. 1. Naked Arg-entum is what is commonly called native silver, and is found in grains, in the shape of trees, in a capillary form, and in thin plates. There is another sort called superficial, which is found at *Coningberg* in *Norway*, and in *Wermland*. 2. Malleable Arg-entum is silver mineralized with sulphur, and the ore is malleable and glassy, melting in the flame of a candle. It is found in *Germany*. 3. Lamellous transparent Arg-entum is silver mineralized with sulphur and arsenic, and the ore is malleable and glassy, melting in the flame of a candle. 4. Whitish unformed brittle Arg-entum, called by some brittle silver, and by others silver mineralized with a little arsenic and copper; and the ore is shining and white. 5. Reddish glandulous Arg-entum with many sides, is silver mineralized with arsenic, and a little sulphur and iron. The ore is red, and will melt before it is glowing hot. 6. Dark coloured Arg-entum is silver mineralized with arsenic, copper and iron, and is a black ore, or of the colour of soot, and is found in *Germany*.

AURUM is a yellow, malleable, soft, ponderous, and most tenacious metal, which will not yield any sound. It will melt in the fire when glowing hot, and yields a red glass; but when dissolved in aqua regia it is yellow. 1. Naked Aurum of the rock is native radicated gold that adheres to stones, and is found in *Smoland*, chiefly in quartz, and sometimes in mica, talc, spate and marble. 2. Naked Aurum of the ore is native radicated gold adhering to ores; it is found in *Smoland*, in pyrita, arsenic, lead, iron, silver, and often in blue copper. 3. Naked Aurum, or naked gold, dissolved and adhering to earths of divers colours.



C H A P. XXXVII.

Of FOSSILS or AGGREGATED STONES.

FOSSILS are CONCRETES, PETRIFICATIONS, and EARTHS. A Concrete of the earthy element is a Saxum or rocky stone. 1. The red cotaceous SAXUM, with convex submicaceous plates, consists of a hard, red, somewhat fissile cos, with convex and concave plates, that are reddish on the surface, as also interspersed with white micaceous scales. 2. The cotaceous red Saxum, with white quartzous atoms, is found at the bottom of a mountain at *Falun*. 3. The quartzous acute whitish Saxum is found at *Norberg*, where it is the matrix of iron ore. 4. The quartzous white Saxum, with micaceous fragments on the surface. It is found at *Garpenberg*, where it is the matrix of a copper pyrita. It generally consists of very minute cotaceo-quartzous particles that are often solid, and the surface is as it were smeared with fragments of a very fine white mica. 5. The cotaceo-quartzous Saxum with milky particles is found every where among the mountains of *Dalecarlia*, and consists of a stone of a middle nature, between a quartz and a cos, which is transparent, vitreous, and the interfices of the particles are filled with lesser opaque milky particles. 6. The quartzous, spatous, white Saxum, with a scaly black mica, consists of a stone compounded of quartz and spate grossly mixed, of the colour of water; there may be also seen every where a large black mica, which makes the stone appear black after rain, with large white spots. 7. The whitish quartzous subspataceous Saxum, with a scaly mica of the colour of gold. 8. The flesh-coloured quartzo-cotaceous Saxum, decussated with black micaceous scales. It consists of an exceeding hard cotaceous rock, of a reddish white colour, whose fragments are inscribed with black lines crossing each other; and these lines being

being broken parallel to the sides, discover spots of a thumb's breadth, which are micaceous, black, and superficial. 9. The ash-coloured quartzous marmoreous Saxum, is found at *Salhberg*, where it is the matrix of the silvery galena. 10. The reddish cotaceo-spatous Saxum with quartzous vitreous grains, is found in *Dalecarlia*. 11. The red spatous Saxum, with black mica, and quartzous particles. It is found in *Aland*, and the shores of *Roslagia*; as also in the most barren woods. This stone is very common where the sea has formerly been. 12. The ash-coloured fissile micaceous Saxum, with small granitine and quartzous grains. It is found among the mountains of *Lapland*, which entirely consist of this sort of stone. It is a fissile rock, with fragments of ash-coloured subimbricated unequal mica, on account of red granitine grains of tin, and particles of quartzous sand, with scales of mica interspersed. 13. Flesh-coloured fissile micaceous Saxum, with quartzous grains, consists of depressed grains of quartz, every where speckled, and as it were barked with a red mica. This makes excellent millstones. 14. Flesh-coloured fissile micaceous Saxum, with granitine grains, consists of a rock that will easily cleave, streaked with a silvery impalpable mica, and mixed with reddish granitine grains. 15. The ash-coloured fissile micaceous Saxum, speckled with micaceous quartzous atoms. It is found in various mountains, and consists of an imbricated mica, which will cleave according to the length of the stone, and whose sides are chiefly covered with fragments of mica; but the substance consists of almost impalpable, micaceous, and quartzous atoms, blended together. 16. The cotaceo-micaceous Saxum consists of a scaly silver coloured mica and cos, with white, rough, quartzous grains, in the same quantity as the cotaceous. 17. The micaceous Saxum compounded alternately with black micaceous particles, and white quartzo-cotaceous particles. It is found in *Norway*, and is the matrix of the cupreous pyrita. It consists of several parallel and often undulated strata, and those next to them, which are squamoso-micaceous and black; and a quartzous, whitish, hardish cos. 18. The blackish
micaceous

micaceous Saxum, consisting of aceroso-longitudinal atoms, is found at *Bitzberg*, and is the matrix of iron ore. 19. The impalpable, ferreous, quartzo-micaceous Saxum, full of granites, is by some called the Ringing Stone, and is found in *West Gothland*. It consists of a dark, ash-coloured, hard, martial, micaceous-quartzous, impalpable stone, interspersed with granites, which when struck sound like metal. 20. The blackish Saxum, consisting of spate and mica, with ferreous decussating particles. It consists of high, hard, unequal rock, of a brown colour, mixed with blackish spate and a hard rigid mica; whence, when broken, it appears interspersed with branny, oblong, distinct particles, containing a little iron; for which reason it is mixed with the ore of iron in the melting-houses. 21. The black impalpable Saxum, with red spatous specks and streaks. This is commonly called Porphyry. 22. The reddish impalpable Saxum, with whitish specks and spots. 23. The somewhat impalpable ash-coloured Saxum is found in the mountain of *Falun*, at *Bitzberg*, with metals. It consists of an ash-coloured, somewhat transparent, and almost impalpable rock, made up of quartz and ash-coloured mica, almost inconspicuous. It is the most pure matrix of metals. 24. The impalpable livid Saxum is found at *Dannemore*, and is the matrix of iron ore. It consists of rock almost of the colour of horn, with fragments of flint, that are sometimes a little convex. 25. The calcarious impalpable Saxum, that is of an ash-colour and in the form of schist, is found at *Hunneberg*. It consists of marl, which it exactly resembles when hard.

TOPHUS is a concrete of the watery element.

1. The calcarious Tophus of tea-kettles, according to some, is an aqueous porus, generated of simple water. It is found in tea-kettles, in which water is boiled for daily use. It consists of an ash-coloured crust, adhering to the bottom and sides. 2. The calcarious Tophus of hot baths is found at *Carlsbad*, and consists of a subarenaceous, yellow, brittle, spongy stone, that will ferment with aqua fortis; or of globous tunicated particles heaped together. 3. The perforated,

forated, calcarious, cylindric Tophus is called by some a branched and fistulous Tophus of marl; and by others the vegetable petrifications of the roots of trees and plants. It is the Osteocolla of the shops, and is found in the Electoral Marck of *New Prussia*. The place where it is generated consists of a very fine calcarious matter mixed with sand, and of the dead roots of several trees, as of pines and oaks, that lie deep in the ground. These roots, by length of time, are as it were melted and hollowed, with the afflux of putrified carious moisture. These cavities give shape to the osteocolla, whose substance being dissolved in water, easily enters the roots in the carious parts, and fills up every cavity. This we learn from the fragments of wood and bark, which are of a cellulous contexture, and which embrace the branches of their fossil closely. 4. The lenticular calcarious Tophus is commonly called the Lentils of *Bethlehem*, and is found in *Egypt* and *Palestine*. It consists of white, calcarious, solid stones, of the shape and size of lentils, with a sharp margin, and with an equal, smooth, convex surface. 5. The argillaceous many-formed Tophus is the aqueous solid Porus of some authors, deposited under water that almost stagnates. It is found on the banks of rivers that consist of farinaceous sand, for it consists of farinaceous marly sand, coagulated with vitriolic water; which appears when burnt, for then it becomes red, and it is formed by the flowing water. 6. The argillaceo-ochreous Tophus consists of a cylindric, tunicated, perforated, rusty Tophus, made of some dead putrifying root, through which vitriolic water flowing coagulates the nearest marl, and then the more remote. 7. The arenaceo-ochreous Tophus is found at the sandy bottom of the sea; and that which *Linnaeus* met with consisted of an iron nail dissolved in sea water, which afterwards coagulated with very fine sand and shells, turning into a pretty solid rusty stone. 8. The humous-ochreous Tophus is of two sorts; the one is the Tophus of a fenny place, consisting of iron and ochre, called by some the watery Ore of iron; the other is the marshy Tophus, consisting of ochre and iron, and is called by some

Conchites



Stalactites 355



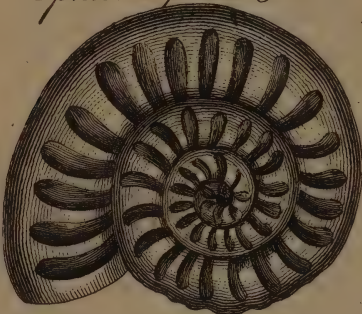
Ammons Horn
308



Conchites



Ophiomorphites 310



Pectanculus



some Iron mineralized with marl; for the ore is in the inside blueish, or of the colour of iron. It consists of marshy soil that has absorbed the vitriol of iron, which becomes coagulated thereby, and by the motion of the water becomes somewhat of a globous shape. It has been the custom to get iron from hence time out of mind.

STALACTITES is a concrete of the airy element.

1. The cretaceous incrusting Stalactites is by some called the cretaceous marly Stalactites, and by others the crustaceous Porus of water, concreted about other bodies. It consists of an earthy cretaceous crust, adhering to the branches of moss and other vegetables; and it is brittle, and of a whitish colour. 2. The marmoreous tunicato-crustaceous Stalactites, with a natrous apex, is called by some the stalactitious watery Porus, concreted out of drops which hang to the roofs of caves like icicles. It consists of white and somewhat transparent marmor, with angular fragments tending towards the centre according to the length, and a perforated hollow apex, from which natrous water continues dropping. 3. The marmoreous branched Stalactites is by some called the Flos of iron, and is found in *Stiria* in iron mines. It consists of round, branched, almost upright, snow-coloured sprigs, in the shape of coral, acuminate at the points, and which will ferment with aqua fortis. 4. The marmoreous solid Stalactites. That which *Linnaeus* had consisted of the bone of a man, that had lain a hundred and forty years in a mine that was stopped up, and which was covered with a rough calcarious crust; and over that there was another, interspersed with shining galena, whose particles were in form of cubes. 5. The spatous solid Stalactites, which consists of white, transparent, thick spate, covered with an ash-coloured crust. 6. The quartzous granulated Stalactites consists of transparent white grains, which appear crystalline through a microscope, and nitro-quartzous.

PUMEX is a concrete of the element of fire.

1. Ash-coloured Pumex of the pyrita is the Pumice-stone of the shops, and is by some called the igneous Porus of the Asbestos stone. It is found in burning mountains.

mountains. 2. The whitish Pumex of iron is found in iron works, and consists of indurated froth, which while melting is taken out of the furnace, and effloresces from the iron itself. 3. The red Pumex of copper is very brittle, of a deep red colour; and is generated on the sides of the mine. 4. The black Pumex of vegetables is commonly called foot, and is found every where in chimneys.

The *ÆTITES* or Eagle-stone is a concrete of natural stone. 1. The *Ætites* with a free earthy embryo, is by some called the *Ætites* with an earth included, but the more common name is *Geodes*. It is found in *Burgundy*, and is a small stone, consisting of a light ochreous tophus. 2. The *Ætites* with a fixed earthy embryo is found in *Smoland*, and consists of an ochreous tophous, containing earth in the middle. 3. The *Ætites* with an embryo consisting of a small free-stone is found in *Swisserland*, and consists of an ochreous tophus stone, in the shape of a pear, and within it are small brittle stones. 4. The flinty *Ætites* with embryos consisting of crystalline fixed stones, is found in *Palestine* and *Egypt*. It consists of a variegated flint or agate, which is somewhat globous or roundish, of the size of a melon, and with a hollow centre full of nitro-quartzous crystals, without columns. 5. The marmoreous *Ætites*, with fixed crystalline embryos, is called by some the crystalline apple, and is like a rough ash-coloured apple, whose centre is full of natroso-spatous convergent crystals.

TARTARUS is a concrete of natural vegetables. 1. The saline Tartarus of wine is the red and white Tartar of the shops, and is found in wine-casks, wherein it sticks to the sides. 2. The Tartarus of beer is the dregs of that liquor, and is found in beer-casks.

CALCULUS is a concrete of animals. 1. The urinary Calculus is the stone of the kidneys and bladder, and is found in variety of animals. 2. The salival Calculus is the tartar of the teeth, and sticks to teeth that are not properly cleaned, and is sometimes found in the salival glands under the tongue. 3. The tracheal Calculus is a stone of the lungs, and is chiefly found in the branches of the trachea, especially, in
masons,

maſons, ſtatuaries, plaiſterers, and wine drinkers.

4. The Calculus of the gall bladder is found in the gall bladder of men, oxen, and porcupines. It is a yellow, bitter, light ſtone, with many angles or points, and will ſwim in water. 5. The ſolid gatric tunicated Calculus is commonly called Bezoar, and is found in the bellies of goats; it is likewiſe either oriental or occidental bezoar. 6. The Calculus of cattle with a hairy embryo is found in the ſtomach of ruminating animals, and proceeds from indigeſtible hair that has been ſwallowed, which being compr eſſed into a round ball, becomes covered with a ſtony cruſt. 7. The Calculi of crabs is the crabs eyes of the ſhops, and is found naturally in all kinds and ſorts of crabs. 8. The Calculus of ſhell-fiſh are well known by the name of pearls, and they are excrescences proceeding from the inſide of the ſhell, where the ſide is perforated externally.

PETRIFICATIONS. HELMINTHOLITHUS is a petrified worm. 1. Helmintholithus or the Lithophyte is of ſeveral ſorts, as of coral, which is divided into the madreporæ or aſtroites, the milleporæ, the tubiporæ, and the ſertularia. 2. The teſtaceous Helmintholithus is a ſtony ſhell, as the Patella, called the Petellites; of the cockle named Neritites; of the nautilus, called *Ammon's* Horn, with a plain turn; the orthocerotes, the belemnites, which is the lapis lyncis of the ſhops. There are alſo the oſtracites, the conchites, the muſculites, the peſtenites, the buccardites, the hyſterolithus, and the balanites, which are all petrifications of the ſhells whoſe names they bear. 3. The Helmintholithus of the zoophyte; as the echinites, the radioli, the aſteria, which is the ſea-ſtar petrified; the Meduſa, which laſt is a Helmintholithus with a great number of branches, that are parallel, angulated, and articulated with many joints, that have many clefts. Some call it the Encrinus or the ſtony lily, and others the columnar aſteria, arcuated like an entrochus. 4. The Helmintholithus of a reptile, as of an earth-worm, and of aſcarides.

ENTOMOLITHUS is a petrification of the crab-fiſh kind, by ſome called the petrifications of cruſtaceous

ceous animals. They are found in *France*, and consist of a whitish kind of marble. *Linnaeus* calls lobsters, crabs, prawns, and shrimps, Insects.

ICHTHYOLITHUS is the petrification of fishes.

1. The Ichthyolithus of schistus is called by some the Zoolypolithi of fishes; and they are found in *Hesse*, *Eisleb*, and *Mansfeld*. 2. The Ichthyolithus of marble consists of a fissile whitish marble, and is found near *Hindelsheim*. 3. The Ichthyolithus of the teeth of cetaceous fish is commonly called Glossopetra, and is found at *Malta*, and in the *Mediterranean Sea*. 4. The Ichthyolithus of a convex tooth is named by others the petrification of the grinders of fishes, and in the shops Bufonites.

The AMPHIBIOLITHUS is the petrification of an amphibious animal. 1. The Amphibiolithus of a serpent is very scarce, and generally consists in nothing but the bones in a fissile stone. 2. The Amphibiolithus of a lizard is very uncommon. 3. The Amphibiolithus of a frog is still more scarce, which ought to be carefully attended to.

ORNITHOLITHUS is the petrification of a bird.

1. The Ornitholithus of a whole bird is very seldom found, which ought to be noted. 2. The Ornitholithus of the beaks of birds is met with in *Switzerland*. 3. The Ornitholithus of the feathers of birds is found in schist, or fissile white marble. 4. The Ornitholithus of the nests of birds is pretty often found in stactites.

ZOOLITHUS is the petrification of quadrupeds.

1. The Zoolithus of mankind is very rare. 2. The Zoolithus of deer is found at *Geneva*, and so of other kinds. 3. The Zoolithus of the sea-calf with large dog teeth, which some take to be elephant's teeth. It is called Fossile Ivory, and is found in *Russia* and *Siberia*. 4. The Zoolithus of a blueish green tooth is the turquois stone, and will admit of polishing like a gem. The places where they are met with are not very common.

PHYTHOLITHUS is a vegetable petrification.

1. The Phytholithus of plants, or the vegetable petrification of plants, is generally found in schist, and
is

is looked upon as a great rarity. 2. The *Phytholithus* of fern is by some called the petrification of capillary herbs. It is found in *Switzerland*, and consists of black schistus or marble, in which are impressed several kinds of fish and plants, but more particularly fern or polypody. 3. The *Phytholithus* of roots is the vegetable petrification of the roots of trees and plants, and is found in the southern parts of *Europe*. 4. The *Phytholithus* of trunks of trees is the vegetable petrification of trees, which is met with in *Switzerland*; and there is one in the cabinet of Count *Tessin*, which is a trunk of a tree consisting of pure agate. 5. The *Phytholithus* of leaves is the petrification of the leaves of plants and trees, and is met with in schistus or white fissile marble, where many of these leaves are very like those of the willow. 6. The *Phytholithus* of flowers, as the cupreous ear of rye, which was found in schistus. 7. The *Phytholithus* of fruits is a petrification found in *Germany*, in schistus or marble. *Linnaeus* had a perfectly calcarious walnut.

GRAPTOLITHUS is a petrification appearing like a picture. 1. The *Graptolithus* with lines resembling a map was found in *Scania*. 2. The *Graptolithus* representing battles, cities, and ruins, is chiefly found in *Florentine* marble. 3. The *Graptolithus* representing woods, groves, plants and mosses, is found in agate, particularly in *Egypt*, and the white fissile marble of *Hindelsheim*. 4. The *Graptolithus* representing sea weeds is found in *Gothland*. 5. The *Graptolithus* representing stars and shining points is called the *Star-stone*. 6. The *Graptolithus* having circles within circles is often found in shelly petrifications. 7. The *Graptolithus* whereon are irregular spots or points is found in *Scania*.

TERRÆ. MARGA is an indurated earth, that will not grow moist in water. 1. Argillaceous white Marga is commonly called *Stone Marl*, and is met with in the chinks of rocks. This is commonly of a hoary or ash-colour, and is certainly generated of marl in the chinks of rocks. 2. Red ochreous Marga, commonly called *red Ochre*, or rather *Ruddle* or *Raddle*, is found in the chinks of marble and cos. It

is commonly red, and a little fissile, but as hard as sealing-wax, or harder.

OCHRA is the remainder of the solution of metals. 1. The yellow Ochra of iron is commonly called the ochre of iron, and is the earth of iron precipitated, but not mineralized. Besides which there is the red ochre of iron, and they are found near purging springs and marshes. The yellow when burnt always becomes red. 2. The green Ochra of copper is green copper dissolved or corroded and precipitated. It is common in copper-mines. 3. The blueish Ochra of copper is blue precipitated copper, and is found in copper-mines. It consists chiefly of an impalpable earth of no certain shape. 4. The germinating Ochra of copper is the native streaked verdigrease. It is found in *China* and *Germany*, and consists of brittle streaks proceeding from the centre, which is either blue or green. 5. The yellowish white Ochra of lead is by some called the mineralized galenous Ore of Lead, mixed with impalpable earth, of a whitish or reddish colour. 6. The tawny Ochra of tin is found in *England*. 7. The red Ochra of bismuth is the ore of cobalt, and is found in *Helsingia*, and *Germany*.

CRETA consists of farinaceous brittle particles that colour the fingers, and it will ferment with aqua fortis. 1. The rocky white Creta is common chalk, and is found in the hills of *France*, *England*, and *Denmark*. 2. Marly Creta, which is brittle and may be cloven, is a sort of marl that will dissolve when exposed to the air. It is found under earth and marl, in solid white fissile strata; it will ferment with aqua fortis, and entirely dissolve in water. 3. Earthy white Creta is a coarser and more brittle kind of chalk. 4. Earthy purplish Creta. 5. Earthy shelly Creta consists of flesh-coloured scaly earth, that will ferment with aqua fortis, and proceeds from the shell of the muscle.

ARGILLA consists of slippery, tenacious, fat, plastic particles; it will not ferment with aqua fortis, unless mixed therewith, and it is clammy when softened in water. 1. Calcareous Argilla consists of clay that will ferment with aqua fortis, of an ash-colour, or a little reddish. 2. Fissile Argilla is a fat clay that may
be

be cloven into thin plates, and will grow soft in the air. It is found in *Gotbland*, in the clefts of cos. 3. Tesselated Argilla is the tessellated potter's-clay, and is found almost every where. 4. Bluish Argilla is a rough sort of clay that will melt into glass, and is met with in almost all fluids. 5. Very white Argilla, here and there a little flesh-coloured, is found in *Holland*. 6. Flesh-coloured Argilla. 7. Argilla that will melt in the mouth is a kind of bole, or terra sigillata, of which there are several sorts, as the white bole, the ash-coloured, the yellow, the red, and the flesh-coloured, or *Lemnian* earth. 8. Argilla mixed with sand is a reddish clay that swells with water, and retains it a long while; it is found every where by the sides of roads, and in barren grounds. 9. Sandy Argilla mixed with gravel is by some called *Adam's Earth*, and is met with every where. This is the matrix of rocks and stones, and when very dry is hard to be penetrated, even with a wedge and mallet; but in the spring and autumn it is more soft. When sifted, it is used for ovens in *Sweden*.

ARENA consisting of pulverized stones and minerals.

1. Impalpable Arena, which is a little mealy, is generally found among groves of pine-trees. 2. Impalpable running whitish Arena, is met with in springs and fountains. It consists of an exceeding fine white transparent equal Sand. 3. The quartzous Arena, that is blown about by the wind; it is found on the sea-shores in some places, and sometimes under clay. 4. Quartzous rounded equal Arena, is found on the sea-shore. 5. Quartzous rounded coloured Arena, is of various colours, as red, yellow, purplish and tawney. 6. Micaceous Arena, is by some called the micaceous squamous Sand, and by others, shining Sand; it is sometimes of a silver and sometimes of a gold colour. 7. Heterogeneous Arena, consists of large unequal particles, and is commonly called Gravel. It is found on the sea-shores, and is dug up almost every where, for different purposes. 8. Ferreous black Arena, is by some called black irony river Sand, and is a sand mineralized with iron; it is found in the rivers that fall from the mountains in *Lapland*; it consists

fists of the pure ore of iron, all whose particles may be attracted with the loadstone. 9. Golden Arena, is native gold of several colours, found among earth or sand in the *Ganges* and other rivers.

HUMUS that proceeds from the rotting of vegetable and animal substances; and will burn in the fire, and swell with water. 1. The stony Humus of Schistus, is found among clay. It is that Schistus that is met with in mountains, which being long exposed in the open air, grows soft and reddish, till it turns to a red earth, though very hard, and at length it spontaneously is resolved into black earth. 3. Vegetable aquatick Humus, is a sort of clayey vegetable earth, and is found in ponds and lakes every where. 4. Fermenting Humus, is found on heaths, and is a kind of spongy earth. 5. Vegetable Humus of the *Alps*, is found every where on those mountains, and it is reddish or of a blackish brown. 6. Common vegetable Humus, is a black earth, and is found in fields, meadows and pastures. 7. Reddish, ochreous vegetable Humus, is found in *West Gothland*. 8. Animal Humus of brute beasts, is called animal Earth, and is found in those places where many animals have been buried. 9. Human animal Humus, is the earth of church-yards, where it is found.

Linnaeus is of opinion, that the first or principal earth, consists only of sand, out of which by assistance of the elements the whole stony kingdom is produced; and hence he thinks all other stones have from time to time proceeded. The generation of simple and aggregate stones, are produced only by the external apposition of the particles; but if they are impregnated with any mineral principle, and particularly a saline, dissolved in any fluid, then they are called compounded stones. In this kingdom nothing proceeds from eggs, and there is no circulation of fluids through vessels, as in other kingdoms; hence proceed all the varieties of stones.

Every kind of stone, almost without exception, had its original from earths, beyond all doubt; thus vegetable pond earth produces a schistus, a fungous earth a cos, and from a cos sand proceeds; from clay, marble,

marble, and from marble, chalk. When stones are impregnated with any substance that is foreign to simple stones, they are called ores. Mixed earth, if it coalesces, is called a concrete; petrifications commonly arise from clay, changed into a calx, a few only excepted. We may account for mountains and petrifications in the following manner; the bottom of the sea consists of sand, often covered with earth. The terrestrial sediment of the sea is clay, which thus becomes the daughter of the sea. The water will scarcely deposite any sediment, unless it be at rest; and rest is brought about by plants swimming on the top of it, as well as other foreign substances. Sargazo is a kind of fucus, and where it abounds on the surface of the sea it renders it calm, and green like a meadow. Under this marine meadow, there are zoophytes, shells, lithophytes, fishes, with their spawn; and also birds frequent them, which are scarce seen in any other places. These dying successively, the bottom is covered with their exuviae, and the proper clayey sediment of the sea, almost as high as the surface; this done, the said fucus is driven by the force of the waves, and soon after thrown on the sands of the sea-shore, where it concretes into a stone. But the shells of shell-fish, and lithophytes, formerly produced by animals, being mixed with clay, change it into marmor, which in every part discovers these petrifications; thus petrifications do not proceed from calx, but calx from petrifications: thus stones proceed from animals, but not the contrary. Thus also stony rocks are not primæval, but the daughters of time. These things have been learnt, from the mountains of *Greenland*, *Gothland* and *West Gothland*.

Apyri have been said to be such stones, as will resist the force of fire a very long while, whence they are extremely proper for the making of chymical vessels; however, no substance whatever, not excepting silver and gold, can withstand the force of a good burning-glass. Quartz and spate, are parasitical stones, as may be discovered by viewing them; for they are generated in the hollows of other stones, where they grow. They are produced by water, retained in the
clefs

clefts of rocks, which is impregnated with stony exhalations ; perhaps likewise the air is an assistant : they begin to grow on the surface of the rock, and are continually encreasing, and thus they are generated. That they proceed from water at first, appears from hence, namely, that vegetables are often seen included therein.

All stones that have many sides, except petrifications, proceed from salts ; for they are the only cause of chrystallization. But as salts can only act when they are dissolved, therefore it must be done in a fluid. Chrystal stones that proceed from quartz and spate, only differ in shape : and all chrystals are produced in a fluid. The figure of chrystals, with natrum, nitre, sea-salt, and allum, are the same ; therefore chrystal stones are compounded by means of salts. This is confirmed by the matrix, the colour, the place, the transparency, the properties, the figure and the kinds ; as also by urine, tartar, and the stalactites.

There are two very common vitriols, namely, of iron and copper ; hence there are the same number of pyrites and common okers. All vitriol is imbuted with a mercurial, and every mercurial with vitriol ; for which reason, the pyrites does not produce transparent, but opaque chrystals. Every kind of vitriol has its particular form ; and hence the shapes of the pyrites are derived. The *caput mortuum* of these produced by nature, is oker ; and when this proceeds from iron it is yellow, but after burning red ; that from copper, dissolved by an acid is green, but by an alkaly, blue : thus stones compounded with iron, are yellow and red, and with copper, green and blue ; at least they are generally so, if not always.

Most gems or precious stones are transparent, and proceed from a quartzous nitre, and they only differ from each other in colour ; hence those are vain that value them so much, and foolish who prescribe them as medicines. Humus of every kind, proceeds from the rotting of vegetables and animals. Thus far *Linnaeus*.

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